# Welding Engineer

PRICE 50 CENTS

AUGUST, 1955

Jackson's fully insulated, safe arc welding electrode holders have been made since 1934. More than 2½ millions have been sold.

Progress, through constant research, resulted in the best alloys for the tongs, the most durable fiber glass plastic for the insulation.

Model A-W, shown here, the world's most popular, exemplifies the high standards of quality maintained by Jackson Products.

JACKSON
PRODUCTS, INC.
WARREN · MICHIGAN

Jackson Electrode Holders, Ground Clamps, Cable Connectors, Splicers and Lugs
Jackson Safety Hats, Welding Helmets, Goggles and Eyeshields
Sold World-Wide through Distributors and Dealers

# WHERE GOOD WELDING is a *must* DURO HOLDERS are used *most*

At Farrel-Birmingham Co., Inc., Ansonia, Conn. for instance, long-lasting Duro holders are used to weld heavy machinery, such as this base of a 2,000 HP rolling mill drive and pinion stand. Duro standard holders come in semi- or fully insulated models. They speed output and are less tiring to use. Duro holders are lightweight and perfectly balanced to make working less awkward no matter where the weld must be made.

## Here's news for you!

THE **DURO-Lite**

16 ounce WELDerweight Champion

Wins by a technical knock-out. Proven DURO-bility. Used all day—every day with long, trouble-free life. Write for folder.

## Here's why they DO IT with DURO

- POSITIVE GRIP JAWS—hold small or large electrodes.
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- REPLACE PARTS QUICKLY—only screwdriver and wrench needed.
- SAFE, SQUARE GUARD—protects hands from heat. Prevents rolling and grounding when set down.
- FAST CABLE CONNECTIONS—hex key fitted into brass core and held in place by the fibre handle.

Available in 250, 300, 400, 500 and 600 amperes.

**DURO ENGINEERING CO.**

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# Here's WHY you get better welding faster with HOBART arc welders

## Look inside

. . . check the engine
. . . check the generator
. . . check the performance

for famous HOBART QUALITY
. . . plus the

## EXCLUSIVE FEATURES

that give you low welding costs

1 Convenient Control Panel
2 Remote Control for improved quality of welds
3 Dual Control gives 1000 combinations of welding heat
4 Convenient Polarity Switch
5 1 KW DC receptacle for auxiliary power
6 Automatic idling control
7 Push button self starting industrial engine
8 Your choice of sturdy portable mountings
9 Protective steel canopy with hinged side panels

(METERS OPTIONAL)

**Leading contractors, pipeline builders and metal working shops everywhere find this new Hobart Gasoline Engine Driven Welder costs less, does more.**

**YOU'LL FIND** Hobart Arc Welders are the most complete welder units on the market today. The best proof of Hobart's superior advantages and values is comparison with other welders. Try a Hobart—see why you get more actual benefits in dollar savings and increased profits because of its higher performance, faster welding and lower cost operation.

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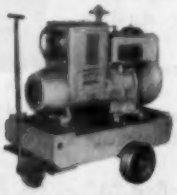
Transformers


Air Cooled "Husky Boy"

Air Cooled AC Power —AC Welder

## Look to HOBART for Better ELECTRODE VALUES

Hobart's complete line of electrodes offers you a practical solution to every welding problem. You'll find a size and type best suited to meet your particular requirements on every job. Write for complete electrode catalog.

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☐ Tell me about_____amp. capacity
☐ Gas Drive ☐ Electric Drive ☐ AC Transformer
☐ Husky Boy ☐ AC Welder—AC Power. Our work is

_____

NAME_____ POSITION_____

FIRM_____

ADDRESS_____

☐ Would like to try sample of Hobart Electrodes for (type of work)_____

**Welding stainless steel to mild steel** in downhand position with Inco-Rod "A". See the finished weld in the picture below.

# For welding dissimilar alloys ...NEW INCO-ROD "A"

You'll like the versatility of the new Inco-Rod "A"...

It welds many combinations among such dissimilar alloys as ferritic and austenitic stainless steels, mild steels, low alloy steels, and high-nickel alloys.

Inco-Rod "A" is expected to give sound, strong and ductile welds on better than 90 per cent of dissimilar metal jobs in the average plant.

Extensive tests, in both field and laboratory, indicate that most joints involving dissimilar alloys can be welded with Inco-Rod "A".

* * *

**Get the free new booklet on Inco-Rod "A".** It tells you where to use Inco-Rod "A". It gives you data on test-welds of 21 different alloy combinations—facts about the excellent tensile and bend properties obtained. Write Inco today for this helpful booklet.

## Six more reasons you'll like new Inco-Rod "A":

1. **Ease of welding** — Inco-Rod "A" has excellent operability in all positions — with spray-type arc and good slag removal.
2. **Dependability** — Inco-Rod "A" permits production of X-ray quality welds.
3. **High corrosion resistance** — Inco-Rod "A" produces welds with corrosion resistance expected to equal or exceed, in most cases, that of either alloy being welded.
4. **Handy packages** — Inco-Rod "A" comes in 5-lb., asphalt-lined, protective tubular containers.
5. **Four convenient sizes** — Inco-Rod "A" is supplied in 14-inch lengths in four diameters: 3/32- with center grip and 1/8-, 5/32-, and 3/16-inch with end grip.
6. **Distinctive flux color** — The green flux coating of Inco-Rod "A" prevents mix-ups with other electrodes.

**Note close ripples and even contour** of weld made with Inco-Rod "A". This versatile electrode was developed specifically for joining dissimilar metals to each other.

**THE INTERNATIONAL NICKEL COMPANY, INC.**
67 Wall Street New York 5, N. Y.

INCO
TRADE MARK

**Welding Products**
Electrodes • Wires • Fluxes

# Welding Engineer

AUGUST, 1955
Vol. 40—No. 8

A MAGAZINE OF JOINING AND SEVERING OF METALS

America's pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1898

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# It all adds up!

*Arc and Thermit welders for years have looked to Metal & Thermit for the electrodes, machines, and accessories they need, and for the research, engineering data, technical assistance, and ordering convenience that Metal & Thermit can offer. To the thousands of welders specifying M&T equipment, it all adds up to profitable welding. You, too, can enjoy the same unsurpassed purchasing economy and technical assistance by which so many others profit. Write now or call your M&T man for information on your requirements. There's one near you.*

*M&T welding products include:*

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mild steel
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aluminum bronze
cast iron
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cable
helmets
lugs
gloves
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**THERMIT WELDING MATERIALS and ACCESSORIES**

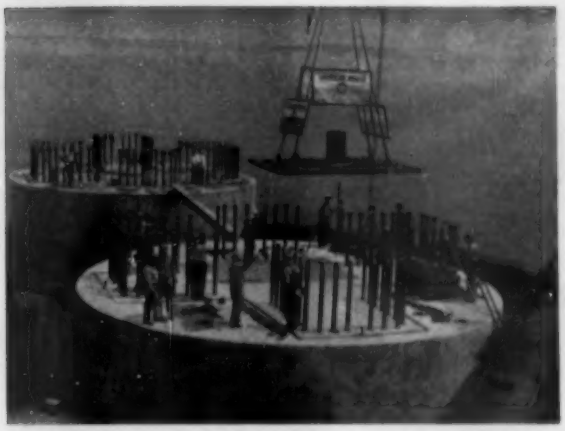
for the fast, low-cost fabrication and repair of heavy equipment.

**METAL & THERMIT CORPORATION**

*Welding Division*

100 EAST 42nd STREET, NEW YORK 17, N. Y.

GRINDING-wheel firm was one of first-time exhibitors at recent welding show



13-TON steel base plate being placed on top of Mackinac Bridge tower by workmen of American Bridge Div., U. S. Steel Corp.

# News

## Grinding wheel firm enters welding field

One of the first-time exhibitors at the third annual welding show in Kansas City, Mo., was The Metal Removal Co., a Chicago firm that manufactures grinding wheels. The company only recently entered the welding field, with new and heavier types of wheels than it had previously been making.

Formerly located at 1546 N. Orleans St., The Metal Removal Co. is now in its new plant and offices at 1801 Columbia Ave., on Chicago's North side.

* * *

## Welding supply association formed in New England

Joseph E. Martin, head of the Middlesex Welding Supply Co., Everett, Mass., was recently elected president of the newly-formed New England Association of Welding Supply Distributors, Inc. The association has been formed by 23 welding-supply firms located throughout New England.

Others elected were: vice-president, S. A. Zane, Zane Weldcraft Supplies, Hartford, Conn.; treasurer, R. C. Anderson, Arlington, Mass.; secretary, William M. Foberg, William M. Foberg Co., Everett, Mass.

Directors are: E. S. Oppenheimer, Harris Calorific Sales Co., Boston; Al Thomas, Northeastern Supply Co., Caribou, Maine; Henry Haywood, Welders Supply Co., Inc., Cambridge, Mass.; Roy Silver, Silver Welding Supply, Roslindale, Mass.; B. Sharples, Jonathan Handy Co., New Bedford, Mass.

* * *

## Hill Equipment builds new St. Louis Plant

Hill Equipment Engineering Co., St. Louis, Mo., distributor of welding equipment and supplies, recently moved into its new building at 1413 Pennsylvania Ave. The move, dictated by State construction of new approaches to the Red Feather Express Highway, has resulted in added room for Hill.

The building, of red brick, has 8,000 sq ft of space. It is built on a 24,000 sq ft site. The structure combines under one roof, offices, warehouse, and show room. Both the office and show room are air-conditioned. The firm, a pioneer in the gas and arc-welding markets, was instrumental in the formation of the St. Louis Section of the American Welding Society.

* * *

## Porter purchases Vulcan Crucible Steel Co.

H. K. Porter Co., Inc., Pittsburgh, has purchased Vulcan Crucible Steel Co., Aliquippa, Pa. Vulcan Crucible becomes its twelfth division. James O. Flower, Crucible's president, became vice-president and general manager of the new division.

## First tower steel for Mackinac suspension bridge

With the arrival recently of the first tower steel, workmen began erection of one leg of the north main tower for Mackinac Bridge, said to be the world's longest suspension bridge. This five-mile-long bridge, which has welded caissons, will connect Michigan's upper and lower peninsulas.

First step is placing one of four 13-ton base-plate sections. The base plate is put over bolts which anchor the vertical steel towers to the concrete and steel foundations. The base plates will distribute the 6,960-ton weight of the tower evenly over the foundation pillars. When finished the tower will rise 552 ft above the waters of the Straits of Mackinac.

* * *

## Distributor holds welding clinic and open house

Boyd Welding Co., Erie, Pa., recently held a three-day welding clinic and open house at its warehouse at East 8th & Holland Sts. Factory engineers demonstrated latest developments in welding. Many of the exhibits came directly from the recent AWS show in Kansas City, Mo.

## Single copy price increase

**WELDING ENGINEER has been forced to take a step it dislikes. Beginning with this issue, the price of an individual copy of this magazine has been increased from 35 cents to 50 cents. Subscription rates remain the same.**

**The single-copy price increase is dictated by mounting costs.**

# NEWS

*from page 5*

**TRAILER unit designed by Monson Welding Sales is portable demonstration room for on-the-spot display**

**WELDED steel packing case stands alone amid wooden crates**

### Mobile welding lab for equipment display

"Weld-O-Lab" is a unique unit, designed as a mobile welding laboratory for demonstration of welding equipment by Monson Welding Sales, Inc., Syracuse, N. Y. It can be used in the customer's own plant.

The lab is a two-wheeled, covered trailer, completely interwired and self-contained. It has a Mig (metal inert-gas) welder and a 300-amp rectifier-type welder. This equipment can be changed, depending upon the customer's needs.

A switchboard in the trailer can operate either on 220 or 440 volts. A rubber-covered cable from a switch in the center of the board is 40 ft long. It has three conductors and can be plugged into the customer's power source. This is the only connection that has to be made. The unit contains a 40-gal water tank with its own recirculation pump for cooling purposes. There is also a bulletin rack for display of promotional literature.

As Monson Welding services a territory of about 33 counties, the lab has filled the need of a portable demonstration room, and proven a help in product development on-the-spot.

* * *

### Mid-States appoints West Coast representative

R. C. Fessler & Co., 1123 Westminster Ave., Alhambra, Calif., has been appointed sales representative for Mid-States Welding Products in Southern California, Arizona and New Mexico. The firm will warehouse Mid-States products in order to give better service to distributors and users in this territory.

### *COMING EVENTS*

SEPT. 15-16: Eastern Zone Meeting, National Welding Supply Association, Sheraton-Mt. Royal Hotel, Montreal, Canada.

SEPT. 19-20: Central Zone Meeting, NWSA, Morton House, Grand Rapids, Mich.

OCT. 17-21: National Fall Technical Meeting, American Welding Society, Bellevue-Stratford Hotel, Philadelphia.

OCT. 17-21: Thirty-seventh Annual National Metal Exposition and Congress, Convention Halls, Philadelphia.

OCT. 18: NWSA Luncheon Meeting (Metal Show), Bellevue-Stratford Hotel, Philadelphia.

OCT. 31-NOV. 1: West Central Zone Meeting, NWSA, Hotel Phillips, Kansas City, Mo.

NOV. 3-4: Western Zone Meeting, NWSA, Ambassador Hotel, Los Angeles.

DEC. 5-6: Southeastern Zone Meeting, NWSA, The Dinkler Plaza, Atlanta, Ga.

DEC. 8-9: Southwestern Zone Meeting, NWSA, Shamrock Hotel, Houston.

FEBRUARY (Dates to be announced): Welding Conference, University of Wisconsin, Madison.

FEB. 1-2: Second Annual Midwest Welding Conference, Armour Research Foundation of Illinois Institute of Technology, Chicago.

MARCH 12-14: Fifty-sixth Annual Convention, International Acetylene Association, Hotel Statler, Los Angeles.

MARCH 19-22: Twelfth Annual Convention, National Welding Supply Association, Hotel Roosevelt, New Orleans.

MAY 8-11: Thirty-seventh Annual Meeting, American Welding Society, Hotel Statler, Buffalo.

MAY 9-11: Fourth Annual Welding Show, Memorial Auditorium, Buffalo.

### Let's practice what we preach

How many exhibitors at the recent welding show in Kansas City used welded-steel packing cases to ship their equipment and displays?

As far as could be ascertained, and a check was made of the storage areas of the Kansas City Municipal Auditorium, there was only one manufacturer who used that type case. The others used wooden cases.

Ray Townsend, president of Tweco Products Co., Wichita, Kansas, said his firm made the welded-steel case in its own shop, and it has been used each year for shipping his display booth and equipment. He admitted that the shipping charges were a bit higher because of the extra weight, but insisted it was well worth the added expense because of the insured safety.

*(Because of rough handling, some of the wooden cases break during shipment and often damage the welding equipment and accessories packed inside.)*

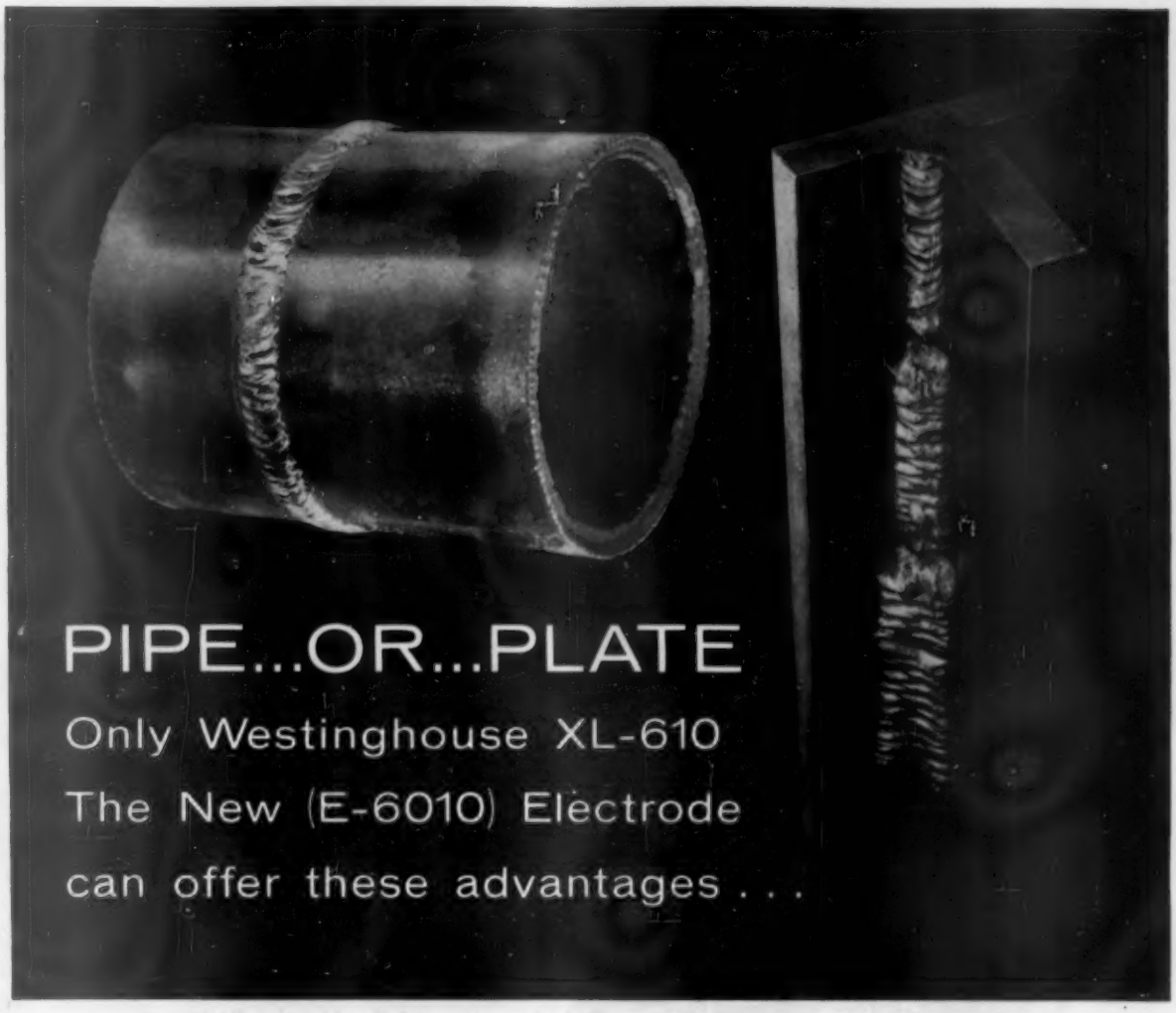
If anyone should try to further the cause of welding, it certainly is the manufacturer of welding equipment. But you have to practice what you preach!

* * *

### Metal & Thermit builds new West Coast quarters

Due to expanded activities, Metal & Thermit Corp., New York City, has built a new warehouse and office building for its sales headquarters for the Pacific Coast Region in the Los Angeles area. Occupation of the new

*(Continued on page 74)*




- Pinhole-free, x-ray quality welds in any position. Fewer rejections, faster production, better quality work.
- Feather-touch slag removal—cleaning time reduced to an absolute minimum.
- Deep penetration for root pass welds. Makes XL-610 especially suited to heavy plate fabrication, pipeline, shipyard, pressure vessel and construction work.
- Extremely low spatter loss, even with high currents. Higher deposition rates, easier cleaning.
- PLUS these exceptional "physicals". . .

J-21911

**YOU CAN BE SURE...IF IT'S Westinghouse**

| ABS Specifications | Westinghouse XL-610 | | |
|---|---|---|---|
| | 5/32" | 3/16" | 1/4" |
| Percent elongation in 2" . . 22% | 28 | 28 | 34 |
| Yield strength, psi . . . . 50,000 | 52,900 | 54,800 | 53,800 |
| Ultimate strength, psi . . . 62,000 | 65,900 | 64,500 | 62,400 |

**WESTINGHOUSE ELECTRIC CORPORATION**
Welding Dept., Box 868
Pittsburgh 30, Pa.

Gentlemen: Please rush full information plus samples on new Westinghouse XL-610.

Name_____ Title_____
Company_____
Street & No._____
City_____ Zone_____ State_____

For the Finest in Hand Protection...

**NEW AO "DREDNAUT"**

line of **COWHIDE GLOVES**

They're SPECIALLY TANNED

- **You get the Flexibility of Horsehide**
- **You get the Tensile Strength of Horsehide**
- **You get the Heat Resistance of Horsehide**
- **And . . . you get the Abrasive Resistance (Longer Wear) of Cowhide**

The "Dredneut" line consists of 6 heavy duty, specially chrome-tanned side-split cowhide gloves styled and tailored with typical AO know-how of what welders want and need. What's more, these gloves are priced to move!

**For hot weather, hot job comfort . . . keep production up with AO Sweatbands.**

LOOK FOR THE AO "Drednaut" and the light green shade. Your nearest AO Safety Products Representative can supply you.

[T. M. REG. BY AMERICAN OPTICAL COMPANY]

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SAFETY PRODUCTS DIVISION

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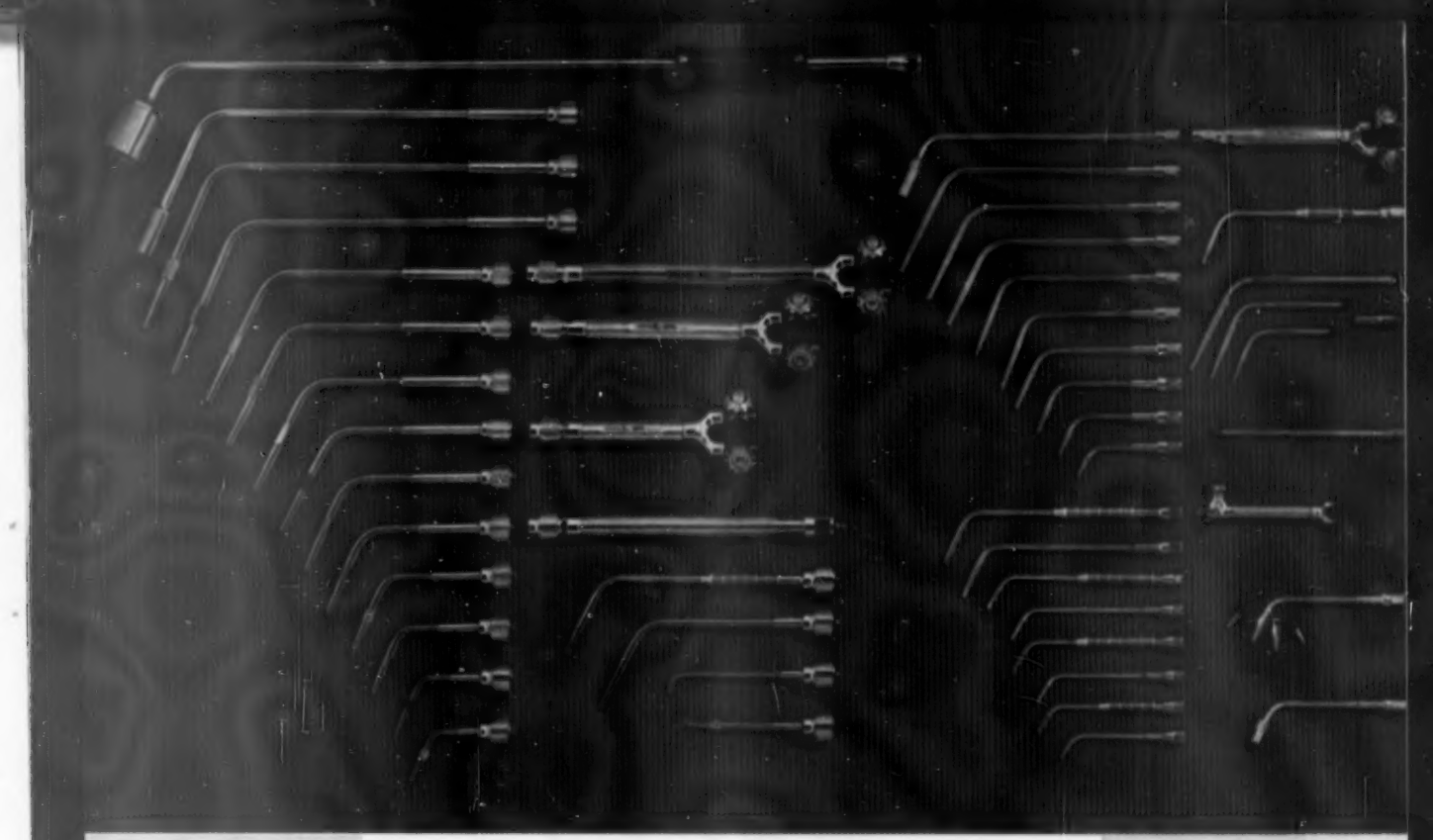

# Fit the flame to the job with

# VICTOR nozzles and tips

Why lose time and waste gas with a "misfit" flame? Start *right* with a Victor torch, match the flame to *any* job with Victor interchangeable nozzles and tips. Victor torches that "grow with the job" cost no more, pay you plenty in faster, better work. See them at your Victor dealer's today, or write *now* for catalog.

VICTOR for welding

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ACCO products

# 3 Big Reasons for Buying PAGE Automatic Welding Wire

**1. Packaged to fit your particular requirements**

**2. A wide range of analyses to fit a particular job**

**3. Greatest convenience — you can buy from local stocks**

**There is every reason why you should look to PAGE for your automatic welding wire needs.** For PAGE not only manufactures wire in an extremely wide range of analyses, but packages them in a variety of ways for the most complete protection and convenience in handling and stocking. PAGE Distributors throughout the country carry stocks — this means savings for you, in ordering time and in inventory investment.

Shown above are some of the handy ways PAGE Automatic Welding Wire is packaged...There are lightweight, durable Leverpaks, which provide perfect protection against coil distortion or wire corrosion. They're easily opened and resealed, roll easily, stack perfectly and take a minimum of floor space.

There are single and pallet-mounted (1,000 lb., 2,000 lb., 3,000 lb.) coils, each wrapped in waterproofed paper and held secure by steel strapping; thread-wound, 25-pound reels to fit popular machines; also, coils in individual cardboard cartons, available singly or palletized for handling by fork-lift truck.

## Page Offers 26 Analyses in Automatic Welding Wire

In order to provide you with *exactly* the correct automatic welding wire for your specific requirements—no matter how "special" or "different" they may be—PAGE offers no less than 26 different analyses from which to choose. These "cover the waterfront" of applications: heavy automatic submerged arc...light manual submerged arc ...inert gas manual and automatic, tungsten or metal arc.

**Carbon Steel** • Any carbon from Armco (.025 max.) to high carbon (.90—1.10). All standard AISI analyses in between.

**Low Alloys** • All the most popular welding grades

**Stainless** • AISI grade. Other types on request

Following is a list of the *26 analyses* in which PAGE Automatic Welding Wire is readily available:

| | | |
|---|---|---|
| Page A-S-Armco | Page A-S-110 | Page NAX-9115 |
| Page A-S-6 | Page A-S-15 | Page-Allegheny A-S-Type 304 |
| Page A-S-10 | Page A-S-15-MO | Page-Allegheny A-S-Type 308 |
| Page A-S-17 | Page A-S-3½-Nickel | Page-Allegheny A-S-Type 308 ELC |
| Page A-S-20 | Page A-S-6150 | Page-Allegheny A-S-Type 309 |
| Page A-S-65 | Page A-S-4130 | Page-Allegheny A-S-Type 310 |
| | | Page-Allegheny A-S-Type 316 |
| | | Page-Allegheny A-S-Type 316 ELC |
| | | Page-Allegheny A-S-Type 347 |
| | | Page-Allegheny A-S-Type 348 |
| | | Page-Allegheny A-S-Type 410 |
| | | Page-Allegheny A-S-Type 420 |
| | | Page-Allegheny A-S-Type 430 |
| | | Page-Allegheny A-S-Type 502 |

***Details of all these analyses are contained in our new Folder DH-402. Write for it!***

# from Page's Wide Range You Can Get Exactly the Analysis You Need for Each Welding Job

• The *right* electrodes and the *right* rods for every welding job! That is what you must have for perfect operation—and that is what you can expect from the wide range offered by PAGE. Choose what you need from this complete line:

### Gas Welding Rods

| | |
|---|---|
| Armco Gas (GB-45) | Page Armco |
| Mild Steel (GA-50) | C Gas |
| Low Alloy (GA & GB-60) | Hi-Tensile M |
| 3½% Nickel (GB-65) | 3½% Nickel |
| .55—.65 Carbon | Medium Carbon |
| .90—1.10 Carbon | High Carbon |
| Manganese Bronze | Manganese Bronze |
| Naval Bronze | Naval Bronze |
| Stainless Steel | According to AWS analysis |

Any Page A-S Automatic Grade in 36" Lengths

### Bare Electrodes

| | |
|---|---|
| Armco | Page Armco |
| Low Carbon | Page "CE" |
| .13—.18 Carbon | Page "B" |
| .55—.65 Carbon | Medium Carbon |
| .90—1.10 Carbon | High Carbon |

### Metal Spray Wire

| | |
|---|---|
| Armco | Page Armco |
| .10 Carbon | #10 |
| .28 Carbon | #25 |
| .40 Carbon | #40 |
| .60 Carbon | #60 |
| .80 Carbon | #80 |
| 1.00 Carbon | #100 |
| 3½% Nickel | 3½% Nickel |
| Manganese Bronze | Manganese Bronze |
| Naval Bronze | Naval Bronze |
| Stainless Steel Metal Spray | According to AWS Analysis |

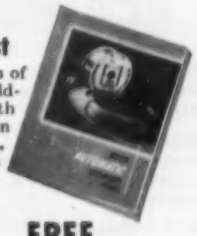
## Convenient Service from Local Stocks

• Whenever you are in need of automatic welding wire, electrodes or welding rods, you can get them quickly and easily from your nearby PAGE Distributor—no matter what part of the country you live in.

PAGE Distributors carry ample stocks from which your requirements can be filled without delay or inconvenience to you. This handy service not only saves you time in getting what you need, but makes it unnecessary for you to make a sizeable investment in inventory. Thus, your nearby PAGE Distributor is able to make double savings for you—a saving in time and a saving in actual dollars.

### Get the full Analysis List

All the 26 analyses of PAGE Automatic Welding Wire are set forth in complete detail in new **Folder DH-402.** A free copy of this informative folder will be sent to you on request. Write to our Monessen, Pa., office.



**FREE**

ACCO

**Page Steel and Wire Division**
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Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

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LOW TEMPERATURE SILVER BRAZING ALLOY

The Ansul Dry-Eye system exemplifies outstanding efficiency in concept and design. It is a product of Ansul developmental research employing a T-flow principle for maximum drying efficiency and a special indicating element which tells at a glance the approximate moisture content of the refrigerant. It is quick and easy to install—and the cartridge can be replaced when required, in less than a minute. This is an important consideration in refrigeration manufacture and service.

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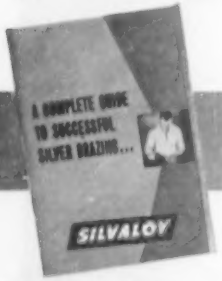
Low temperature Silver Brazing is helping to improve results, speed production and lower costs for manufacturers in many fields. Call the Silvaloy Distributor in your area for complete information or technical assistance. ★ ★ ★ ★ ★

Hex nut is Silvaloy brazed on cap which is in turn brazed to steel body. Air cylinder is used to hold spring-loaded parts in place in induction coil.

ANSUL

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**Letters should be addressed to: The Editor, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill. No letter will be published unless signed, but your name will be withheld if you request it.**

### More on welded house

Dear Sir:

First, may I add my best wishes and congratulations for the fine job you are doing with WELDING ENGINEER. We all look forward to the many excellent and useful articles you present.

I would like to ask a favor. Would you send me the address of John D. Bert, author of June's "Low-cost welded house"? Also, have you anything else on this type of construction, besides your published stories of February and August, 1954? We'd like to build one here—in fact, definitely plan to. We'd like to profit as much as possible by others' experiences.

This welding game is as challenging, yet as rewarding, as any profession in this great land of ours! Your fine publication has claimed and *proclaimed* this fact for many years!

Harry V. Seager
Bernardston, Mass.

Dear Sir:

In the June issue of WELDING ENGINEER, p. 56, is an article written by John D. Bert, entitled "Low-cost welded house."

I am interested in securing the detailed plans of the house pictured in this article.

Frank Gallagher
New Brunswick, N. J.

*—Mr. Bert's address has been sent to Messrs. Seager and Gallagher.*

* * *

### 5-year-old article

Dear Sir:

We should be much obliged to you for letting us have at your earliest convenience a copy of the January, 1949, issue of WELDING ENGINEER, pages 33-35 ("Cold welding").

Klockner-Moeller
Bonn, Germany

*Photostats of the article were sent.*

*(Continued on page 16)*

**Worn gears**

**outperform new ones**

*— at a fraction of the cost —*

**when overlaid with**

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**Electrodes**

You're really cutting your costs when you can save 75%, or more, of the price of new gears, pinions, or sprockets. You can do it by overlaying the worn parts so that they're better than new — with Ampco-Trode, a series of five engineered, copper-base alloys with hardnesses from 130-380 BHN. You get a top-notch bearing surface that won't squash out — gives unusual life in severe metal-to-metal wear service. You get an electrode that applies easily on steel or cast iron.

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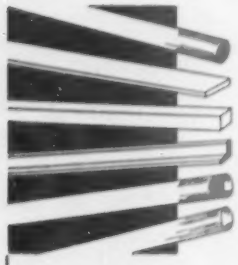


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SPECIAL FLUX
FOR GENERAL BRAZING
FOR CAST IRON WELDING
FOR CAST IRON BRAZING

## LETTERS . . . *from page 13*

### Cellulosic electrodes

Dear Sir:

Your magazine, in my opinion, is the leading publication in the welding field. I am a weldor who believes in keeping informed as much as possible on welding development. This I have managed to do by subscribing to and reading WELDING ENGINEER.

Many times I have quoted facts from the magazine in discussions on welding with fellow workers. Recently a question as to the necessity or advisability of keeping cellulosic electrodes in heated ovens arose.

I quoted one of your magazine's articles, of perhaps a few months ago, as saying that these electrodes were least affected by dampness, and that they should not be kept in ovens.

The article also stated there was a certain amount of moisture in the makeup of the cellulosic coating and that to dry this out would be to disturb their chemistry.

Unfortunately, I cannot locate the copy of WELDING ENGINEER containing this article, and I don't even recall its name.

Can you help me by sending a copy of the article? I was asked to prove my statements.

I intend to save all my back issues for reference from now on.

Name withheld

*—Our correspondent, who wishes to remain anonymous, is referring to "Here's how to end porous welds," by Helmut Thielsch. This article appeared in our December, 1954, issue.*

• • •

### A better connection

Dear Sir:

Your June, 1955, issue contained an article entitled "Stop overheating of welding cables" by R. Kraus. Mr. Kraus bemoans poor circuit connections of both solder and mechanical types—the solder type as too light for welding service and the mechanical type as not properly designed for welding cable. Mr. Kraus overlooked a connection designed for welding cable which outperforms both of the aforementioned.

I refer to the "Caddy" connection which actually welds the cable to the lug or cable with copper. No oxidation of mechanical contact between cable and lug and no overheating melt-out, such as is possible with solder. The connection lasts the life of the cable.

Leonard Gelfand
Erico Products, Inc.

*(Continued on page 48)*

Announcing:

# The B-11 — A great new Norton resinoid bond

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Joining the list of famous Norton bonds that have made grinding wheel history, the new B11 resinoid offers important new performance-benefits to heavy weld grinding applications. Here's why:

New processing developments have greatly improved the uniformity of structure and therefore the balance of B11 wheels. As a result, they "hug that work" closer, grind cooler and faster, with far less vibration and bounce. For you, this more efficient grinding action adds up to such typical Norton "Touch of Gold" benefits as: better product appearance, less operator-fatigue and longer wheel life.

In addition, you get closest possible duplication with B11 wheels. Hardness increments are evenly spaced throughout the entire grade scale. And to make it even easier for you to choose exactly the right wheel for every job, B11 wheels can be supplied in half-grade increments.

*See Your Norton Distributor*

for details on the new B11 resinoid bonded wheels. Or write to us direct.

And remember, only Norton offers you such long experience in both grinding machines and wheels to help you produce more at lower cost. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts. W-1666

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## offer a group of tested performance features

# COMPARE THE VALUE

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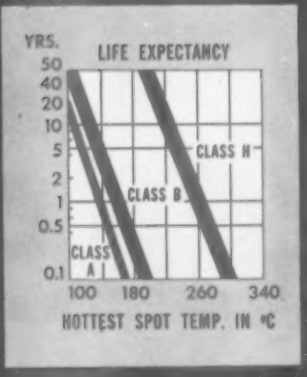
**MOVING COIL DESIGN:** inherent stepless adjustment permits pin point accuracy in current settings.

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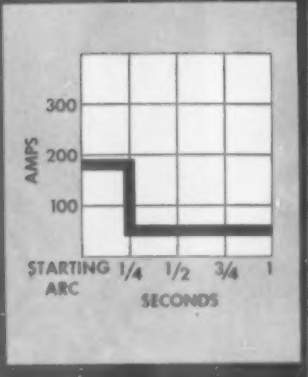


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**ASK ABOUT FREE TRIAL OFFER—Contact your local G-E Welding Distributor for full information. He is listed in the yellow pages of your phone book. Write for Bulletin GEA-6243 to Sect. 711-2, General Electric Co., Schenectady, N. Y.**

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**ARC STABILIZERS** assure steady arc, faster welding, fewer "patch ups."

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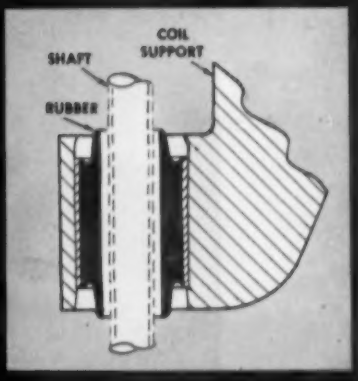


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GENERAL ELECTRIC

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## *with the new* SIGMA SPOT-WELDING *process*

- Joins metals up to ¼-in. thick
- Adds filler metal automatically
- Welds from one side of the joint
- Shields weld area with inert argon gas
- Operates on Constant Potential power supply

**Spot, plug, and tack-weld with one torch.** With sigma spot-welding you can make strong spot welds quickly on lapping metal sheets up to ½-in. thick, plug and tack-welds on metals up to ¼-in. thick—and you need access to only one side of the weld joint. Use it on carbon, galvanized, or stainless steel, and copper-base alloys.

**It's easy to use.** Position the "muzzle" of the water-cooled torch and squeeze the trigger—the machine does the rest. A consumable wire electrode is fed into the weld area as filler metal. Inert argon gas protects the weld from the air. You can make up to 10 welds a minute, with a completely automatic welding cycle.

**Constant Potential adds to efficiency.** Sigma spot-welding equipment operates on constant potential power supply to give you the benefit of simplified controls, sure starting, and precise arc voltage. Weld-cratering and wire-sticking are eliminated. Welds are smooth and consistently uniform.

Your local LINDE representative will be pleased to give you booklet F-8778 and more detailed information on the sigma spot-welding process.

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ESTABLISHED 1916 — Welding Engineer — AUGUST, 1955

# *Let's standardize weldments*

FABRICATORS of weldments are crossing themselves up!

In an eager-beaver desire to get business, some are giving their customers the "business." It is a move not likely to win friends. The situation, in fact, seems to call for some standardization. We realize that we have editorialized against welding standards—but only against those which hamstring welding by their restrictive nature. But when it comes to weldments, there is certainly a need for standards.

Anyone who submits drawings of a weldment to a dozen fabricators for a price estimate will get a dozen different bids, and the prices will vary by such wide margins that it appears some bidders just don't know what they are doing. It happens every time unless the purchaser knows exactly what he wants and ties the bidder down by rigid specifications.

Unless something is done to insure top-quality weldments for a given condition, fabricators are going to find themselves in trouble.

If the product to be fabricated should be stress relieved after welding—to insure that the surfaces will remain in alignment after machining—the fabricator shouldn't lose the job merely because he is honest enough to include stress relieving in his bid.

Many fabricators have had their bids refused, however, because they made such recommendations, and the customer didn't know or wasn't sure. A standard specifying that stress relieving is essential for weldments subjected to certain conditions of use would avoid this situation.

A STANDARD for weldments would also keep a customer from buying a machine base which was stuck together with a minimum of welding because it was the cheap way. This "cheap way" may be good enough for *some* weldments. When that is the case, let's do it according to a standard —tack-welded assemblies could be the lowest on the classification list. The more complicated the fabricating operation, the higher the classification number.

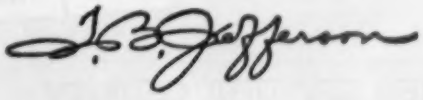
Such standards won't be easy to set up. Even among the better fabricators there will be considerable variations for a specific application. Nevertheless, along the way there will be "meetings of the minds" as to some of the necessary requirements. With such a starting point, standardization attempts may be made.

THIS may sound like another restrictive practice to make welding cost more, but it need not be the case. It *must* not be! It would simply be a means of protecting the customer by assuring him that the weldment he buys is guaranteed to be the proper one for his application. It would also insure uniformity in what the fabricator proposes to do.

If the job requires a tack weld, it could possibly be a "Class 1" weldment, and every fabricator would bid tack welding. Such a move should eliminate wide variations in price. A "Class 2" weldment could be one having welds designed to develop the full strength of the parts being joined. Each scale would indicate further refinements of weldments, such as grinding and finishing, non-destructive testing, stress relieving, sand blasting, painting, etc.

Naturally, the ideal condition to develop from such a standard would be protection of the customer. He would be assured that each fabricator bidding would furnish a product finished to the same degree and of equal quality as the next one.

Let's get rid of the slipshod methods of doing business, lest we find ourselves getting the "business" from our customers!



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| VICTORALLOY | Abrasion, severe impact | Tractor rollers, dredge pump impellers, bucket lips and teeth, rock crushers, steel mill wobblers, roll crushers | Acety. AC-DC Elec. |
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| VICTORALLOY "A" | Angular shock, extreme impact, build-up | Clutch parts, gears, crusher plates, gyratory mantles, build-up for hardfacing | AC-DC Elec. only |
| VICTORALLOY "B" | Heavy impact, moderate abrasion | Tractor rollers and sprockets, shovel pads, plates, idlers, etc. | AC-DC Elec. only |
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## For Automatic Application

| THIS TYPE | FOR THESE CONDITIONS | ON THIS KIND OF EQUIPMENT |
|---|---|---|
| VA #1 | Abrasion, medium impact | Crusher rolls, crushers, gyratory crushers |
| VA #2 | Abrasion, impact, Multi-pass application | Steel mill applications |
| VA #3 | Abrasion, light impact | Mill guides, crushers, dredge bushings |
| VA #4 | Multiple layer build-up | Tractor rails, crane wheels, general build-up |
| VA #5 | Heavy impact, abrasion | Tractor rollers, idlers, mine car wheels, sheave wheels |
| VA #6 | Medium abrasion, high impact | Crane wheels, drums, roll necks |
| VA #7 | Abrasion, high impact | Build-up for hardfacing |
| VA #8 | Abrasion, medium impact | Dozer bits, roll crushers, scraper blades |
| VT #60 | Extreme abrasion | Tool joints, grader blades, scraper blades, augers |

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H-11

# "Polished" welding

A GLEAMING ellipsoid of stainless-clad steel on three pipe columns serves as a shining landmark for General Motors Corp.'s new $100,000,000 technical center just north of Detroit. It was designed to blend with the ultramodern architecture and landscaping planned for the proposed 25 buildings of the center.

Unusual precautions had to be taken during welded erection of the 250,000-gal water tower to avoid marring the polished finish. Weldors wore rubber-soled shoes and sat on a specially designed pneumatic-tired carriage while they erected the various courses of the tank and its supporting legs.

Originally, an all-stainless-steel tower had been planned, but this was found to be too costly. The clad plate proved itself "just as good" and cost only a fraction as much.

The plates were hot-rolled at Lukens Steel Co., Coatesville, Pa., to bond the 1/8-in.-thick layer of stainless steel (type 304) to the 5/8-in. thickness of boiler plate (A-283, Grade C).

GM research laboratories ran corrosion and weathering tests on stainless steel to determine whether pitting or corrosion would occur. The results of the tests have been corroborated by the tower itself, which looks as though it will withstand the elements indefinitely.

**LOOKING up past welded diaphragms which help to reduce wind stresses on 140-ft water tower**

### Fire Protection

The 250,000-gal tank capacity insures an adequate storage of water under pressure to supplement the municipal water supply in event of an emergency. This was one of the measures agreed upon by GM and fire underwriters after the disastrous fire of Aug. 12, 1953, which destroyed the Livonia, Mich., automatic transmission plant.

The stainless-clad tank is not a sphere, as are most tanks of its type, but a pronounced ellipsoid 46 ft in horizontal diameter and 32½ ft high. Circumference at the major diameter is 144½ ft.

Total overall height of the tank is 140 ft, with the height of the water level 132 ft. The usable depth of the tank for water storage is not the full 32½-ft height of the tank, but rather 26 ft.

Three supporting pipe columns were fabricated from the same ¾-in. stainless-clad plate as the tank itself. Each is a 5½-ft cylinder 107 ft high.

Two of the hollow shafts on which the tank stands are empty, but the third serves a useful storage purpose. It contains the ladder for the maintenance crews, the pipes for keeping the water tank filled, and a thermostatically-controlled steam pipe to prevent water from freezing.

### Care in Shipment

Design, fabrication and erection of the water tower was done by Chicago Bridge & Iron Co., Chicago.

As fast as various shapes and sizes of plates needed were manufactured and polished at Lukens, they were sprayed with a plastic compound and wrapped carefully in waterproof paper. The plates rested in cradles during shipment.

**SHINY, stainless-clad "pumpkin" provides new GM technical center with 250,000-gal emergency water supply**

Six-inch strips of the masking paper were removed from each side of seams to be welded. The plastic and paper, if heated by the welding torch on the carbon steel side of the plate or in a seam, would produce a discoloration on the stainless-clad surface that would have been impossible to remove.

As much welding as possible was done on the ground, using type 309 electrodes on the stainless steel and E6010's on the carbon steel side. Back-up plates were used to prevent spatter and to insure full penetration of welds. After welding, seams were carefully chipped to remove scale.

Scaffolding was erected to the top of the tower to facilitate handling of the stainless-clad plates. After welded erection, plate sections were wire-brushed and etched with acid to get a "satinized" finish.

All of General Motors' technical research and styling activities eventually will be consolidated at the new technical center. At present, the center is nearing completion. Architects are Saarinen, Saarinen & Associates of Detroit.

**OUTER shell and intermediate-shell assembly have been lapped together under pressure of hydraulic press and are ready to receive the first weld by the Mig process. Carbon dioxide is shielding medium**

MIG WELDING WITH $CO_2$ . . .

# Seals in savings, Seals out trouble

INTRODUCTION of carbon dioxide as a shielding gas for the Mig (metal inert-gas) welding process has enabled a manufacturer of air-conditioning units to realize a savings in gas costs up to 90%.

The Air Conditioning Division of General Electric Co., Bloomfield, N. J., manufactures a packaged unit that comes in a hermetically sealed, welded-steel case. Should trouble occur during the five-year warranty period, the Division will replace the entire cooling system at no cost to the customer.

To be able to make such an offer, you must have confidence in your workmanship and materials. Welds are particularly important. The slightest trace of porosity will allow the highly-volatile refrigerant gas to escape.

Since flux may be harmful to compressor cases and internal components, the Mig process has been specified for two of the three automatic welding set-ups at the G-E plant, and recently these were converted to use low-cost carbon dioxide gas.

### Quality Maintained

Equal or better weld quality has been maintained.

General Electric's own Mig welding equipment is being used for the job, with the semiautomatic gun being positioned for automatic work. More cost reductions are expected with the contemplated installation of new *automatic* Mig equipment.

The new equipment is said to be especially suited for use with $CO_2$—an old gas with a bright new future in the welding world!

The compressor case of the automatic indoor weather plant is an assembly of three pressed shells. These are fabricated from aluminum-killed, low-carbon steel. Wall thickness is approximately ¼ in. Three circular welds join the basic components.

Between the three basic steps, a great deal of auxiliary hand welding and brazing is needed to add various fittings to the shells.

All machine welds are made with 1/16-in., mild-steel electrode wire of the following composition: carbon, 0.06%; manganese, 1.2%; silicon, 0.50%; phosphorus, 0.04%; sulphur, 0.015%; aluminum, zirconium and titanium (together), 0.18%.

### Production Sequence

A roller conveyor carries the three shells through a washing tank which contains a 225-F solution of degreasing compound. After washing, the components are sorted and go their different ways.

The intermediate shell undergoes several operations. First, four terminal bushings are projection welded to it. The inner surfaces of the bushings are then wire-brushed and silver brazed.

Rings of silver alloy are placed over the cleaned surfaces and brushed with a paste flux. An oxyacetylene torch, held from the opposite side of the shell, melts the alloy to provide a gastight seal around each bushing.

The shell then goes back through the washing tank. Rewashing is necessary to remove all traces of the brazing flux.

The inner shell, a dome-like cylinder, is tacked by means of arc welds to the intermediate shell. The assembly is then conveyed to the first of the three automatic welding stations.

### The First Weld

The 16-in. intermediate shell is joined to the 10⅝-in. dome by the submerged-arc process, using a granular flux. The welding head remains in a stationary vertical position while the work is rotated under it.

Clamped to a welding positioner, the assembly is tilted to an angle of 45 deg. Two complete passes are made to eliminate any chance of "pinhole" porosity.

Welding speed is 18 inches per minute, wire-feed speed 260 ipm. Current is 400-450 amp, reverse polarity. Arc voltage is 25 volts, open-circuit voltage 18 volts. Welding time: 1 minute and 50 seconds.

The outer shell also undergoes a variety of operations. When it emerges from the washing tank, two hanger nuts and two bolts are arc welded to it. At another booth, one restriction fitting, one fusible plug, and two valve bodies are manually arc welded

in place. The shell then goes to the centrifugal sandblasting cabinet.

Condenser coils are assembled in the shell's upper part. The condenser fitting, a flat round plate, is welded to the shell, and the coil tubes are brazed to this fitting. An operator chips off the rough edges around the holes of the fitting and grinds its face smooth.

The shell-tube assembly is washed to remove flux and dirt. To rid all moisture from the coils after washing, they are blown out with dry air.

Inner and outer shell assemblies meet at a hydraulic press, which forces them into a temporary union under pressure of 40,000 lb.

### The Second Weld

The girth weld that joins the outer and intermediate shells is made by the Mig process. Inside a curtained booth, the workpiece is clamped to the turntable of a welding positioner and tilted to about 60 deg below the horizontal. The welding gun is tipped about 5 deg from the vertical, and the work is rotated clockwise under the gas-shielded arc.

Again, the same 1/16-in. electrode wire is used as was used in the submerged arc set-up. Speed is 20 ipm, wire feed 210 ipm. Current is 350-400 amp. Welding time is 2 minutes and 10 seconds. Shielding gas: pure, dry carbon dioxide (welding grade) at a flow of 50 cu ft per hour.

### The Third Weld

The third automatic weld is made around the top of the dome to join the inner and outer shells. Originally, this was called the "plug weld" because it was made in a partially machined groove through the outer shell to the inner one. Since then, a design change has provided a hole for the dome in the outer shell so that the plug weld is now an ordinary fillet.

The work is tilted about 60 deg above the horizontal and is "top side up" as compared with the "upside down" position of the girth weld made at the previous station.

The same electrode wire is used here, and welding speed is 21 ipm, wire-feed speed 210 ipm. Current is 350-400 amp. Time interval is 1 minute and 20 seconds. Shielding medium: $CO_2$ at 50 cfh.

For its first test, the entire welded case is submerged in a large tank of water. Air pressure keeps water from entering connections of the case during the testing period. The occasional unit that does not pass this water test is sent back through the production line for chipping and rewelding.

### Rewelding Permitted

Use of carbon dioxide and the new welding wire permits rewelding over the original weld without danger of porosity. Formerly, a defect could not be repaired by rewelding with steel wire—an aluminum-bronze overlay had to be deposited.

Cases that pass the water test are again sandblasted, after which spatter is cleaned from the weld area..

After the compressor and motor have been installed and hermetically sealed within the case, the unit is subjected to further drastic testing. Compressor and condenser performance and electrical efficiency are checked under operating conditions far tougher than normal.

Another water-immersion test follows. Afterwards, the entire unit is inserted within a helium bell. Lightweight helium, a highly pervasive gas, is able to pass through microscopic openings.

If the steel shells or the welds that join them are in any way defective, some helium from the bell will penetrate the compressor case. Its presence there will be indicated by a mass spectrometer.

Because 97% of the welds are passing these rigid tests regularly, the Bloomfield plant will be able to save up to 90% in gas costs by switching to carbon dioxide for shielding.

### Cheaper with $CO_2$

It's not hard to understand why such important savings have been realized through use of carbon dioxide.

A standard-size cylinder of argon, which formerly was used, holds 275 cu ft at normal pressure of 2,200 psi. Its cost is $27.50. A 50-lb cylinder of carbon dioxide holds 438.5 cu ft at ambient air temperature. Its cost is $4.

Simple arithmetic shows that carbon dioxide costs 0.91 cents per cubic foot, while the argon costs 10.91 cents per cubic foot—12 times more!

But other significant facts about welding with $CO_2$ are also being brought out under actual production conditions. These are:

(*1*) At present, the welding speed is the same as with the former gas, but it is expected to be increased greatly with installation of the new automatic equipment.

(*2*) The quality of welds shielded by carbon dioxide is good; they have dense cross-sectional structure and exhibit great depth of penetration.

(*3*) Slightly more spatter is produced by $CO_2$, but the cost of removing it is negligible.

(*4*) To successfully weld with carbon dioxide, the welding generator should be of the constant-potential type. A constant arc length is the key to weld quality with *all* Mig welding methods.

(*5*) A successful technique for carbon-dioxide welding requires: (*a*) a controlled short-arc length, and (*b*) a high rate of wire-feed speed.

(*6*) To minimize carbon dioxide spatter *(once so annoying that it was commonly believed this cheap gas could not be used for shielding purposes)*, all that need be done is to hold a very short arc. Under some conditions, the end of an electrode may actually project below the surface of plates being welded. Another requirement: cool the welding tip by circulating water through it. A cool tip helps prevent adherence of spatter.

**CONDENSER fitting on outer compressor shell is ground smooth. Condenser coils are already in place**

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WELDING ENGINEER wishes to thank J. E. Wingate, manufacturing specialist; John Morrisey, welding engineer; and Joe Van Growski, welding foreman; all of G-E Air Conditioning Division, for the information contained in this article. Photographs are through courtesy of G-E's Welding Dept., York, Pa.

**CONSTRUCTION of buildings, bridges and machinery is one of the six major classes of welding presently governed by safety codes and regulations**

**FIELD erection and welding of unfired pressure vessels and tanks presently is covered by the safety rules of four organizations, the ASME, API, AWS and the AWWA**

*Wisconsin adopts*

# Rules for better welding

BY FRED E. THEILER*

HOW MANY times have we heard the quotation, "A weld is only as good as the weldor?"

The welding industry has long recognized the importance of the weldor and his qualifications, but that is only part of the story. There are additional factors of equal or greater importance which, when grouped together, comprise "procedure control."

These factors are: design and layout of welded joints; selection and inspection of materials; welding technique; organization and construction; check of the welder; preparation for welding, and inspection and tests.

Consideration of these factors, together with proper supervision, should assure a thoroughly sound and satisfactory job for any type of welded construction. A weld, therefore, can be only as good as the weldor *and* the proper application of procedure control.

To this objective, welding codes and specifications are directed. These codes have been formulated to afford reasonably certain protection of life and property, and to provide a margin for deterioration in service so as to give a long, safe period of usefulness.

## Welding Classes Covered

The committees formed within respective sponsoring societies formulated governing codes and regulations for six classes of welding. They are: structural buildings, bridges and machinery; small pressure piping and transmission piping; unfired pressure vessels, pipes and tanks; boiler and pressure vessels; industrial piping; and automotive and aircraft welding.

For control of welding in the fabrication and construction of structural buildings, bridges and machinery, these codes have been adopted and issued:

AWS (American Welding Society) standard code for arc and gas welding of buildings; AISC (American Institute of Steel Construction) specifications for design, fabrication and construction of buildings by arc and gas welding; AWS standard specifications for welded highway and railway bridges, and for fusion welding and flame-cutting in machinery construction.

The governing codes and specifications for controlling field erection and welding of transmission pipe lines or small pressure piping are the:

ASA (American Standards Ass'n.) code for pressure piping sponsored by ASME (American Society of Mechanical Engineers); AWWA (American Water Works Ass'n.) standard specifications for arc-welding steel water pipes up to 30 in.; and ASTM (American Society for Testing Materials) specifications for arc-welding steel pipe.

## Pressure Vessel Codes

These codes have been adopted for control of field erection and welding of unfired pressure vessels and tanks:

ASME code for unfired pressure vessels; API (American Petroleum Institute) code on unfired vessels for petroleum, AWS standard rules for field welding of tanks, and AWWA standard specifications for elevated tanks.

At present, construction of welded boilers and pressure vessels is reg-

*This article is based on a talk given by Mr. Theiler before the Welding Applications Institute at the University of Wisconsin.

ulated by the following codes and specifications: ASME boiler construction code; API-ASME code on unfired pressure vessels for petroleum liquids and gases; codes of the United States Navy, Coast Guard and the American Bureau of Shipping, and by various state and city codes.

In an effort to avoid confusion, most of the states and municipalities having regulations have adopted the ASME Boiler Code in its entirety, or with a few exceptions. This includes most insurance agencies. The ASME and API are at present drafting the best features of all codes into one set of rules.

### Industrial Piping Rules

The governing codes and specifications for the class of welding called "industrial piping" are:

The ASA code for pressure piping (B31.1). This code deals with materials and serves as a guide to state and municipal authorities in drawing up their regulations.

ASME Boiler Construction Code. Of its nine sections, only Sections One, Eight and Nine refer to industrial piping.

API-ASME code for design, construction, inspection and repair unfired pressure vessels for petroleum liquids and gases. This code also includes a piping connection allowance more liberal than Section Eight of the Boiler Code, but as a safeguard this code includes a mandatory inspection and repair schedule.

AWS standard qualification procedure for arc and gas welding. Part One relates the method of qualifying a contemplated welding procedure. Part Two tells the method of certifying weldors under a qualified procedure.

The Army and Navy have codes regulating automotive, ship and aircraft welding. These rules make use of AWS standard qualification procedures.

Why are all these codes necessary? They seem very repetitious. The author and not a few contractors have felt on many occasions that they are "just so much red tape."

### Accidents Claim 10,000

Here are some reasons for the codes and specifications which are written on the basis of minimum requirements for safety.

Records for 41 years, from 1867 to 1908, show that welding accidents resulted in the death of more than 10,000 persons, and more or less serious injury to some 15,000 others.

It took several spectacular disasters to arouse the public to the need for stricter safety rules. One such disaster came in the explosion of a boiler in a Brockton, Mass., shoe factory with a toll of 58 dead, 117 injured, and property loss of $250,000.

Even today, with all of these codes and regulations, there are still accidents that kill and injure. In Wisconsin, three boiler accidents which killed one person and injured several occurred as a direct result of poor welding.

The certification of weldors in Wisconsin is regulated by the Wisconsin Industrial Commission, insurance companies, the Wisconsin chapter of the National Pipe Welding Bureau and federal government agencies, such as the Army and Navy.

### State Welding Inspection

All welding for structural steel buildings and bridges comes under the jurisdiction of the safety inspector for the Wisconsin Industrial Commission, and must pass requirements of the state building code. The welding section of this code was adopted from the AWS standard Qualifications procedures for arc and gas.

All welding on boilers, new and old, comes under the jurisdiction of the state boiler inspector. The state has adopted the ASME code and rules for fusion welding of power boilers and unfired pressure vessels.

The state also has adopted the recommended rules for repairs by riveting and fusion welding to power boilers and unfired pressure vessels, sponsored by the National Board of Boiler and Pressure Vessel Inspectors.

This code provides for inspection of all repair welding done on boilers or unfired pressure vessels. The code states that repairs by fusion welding must be done by a qualified or an approved weldor.

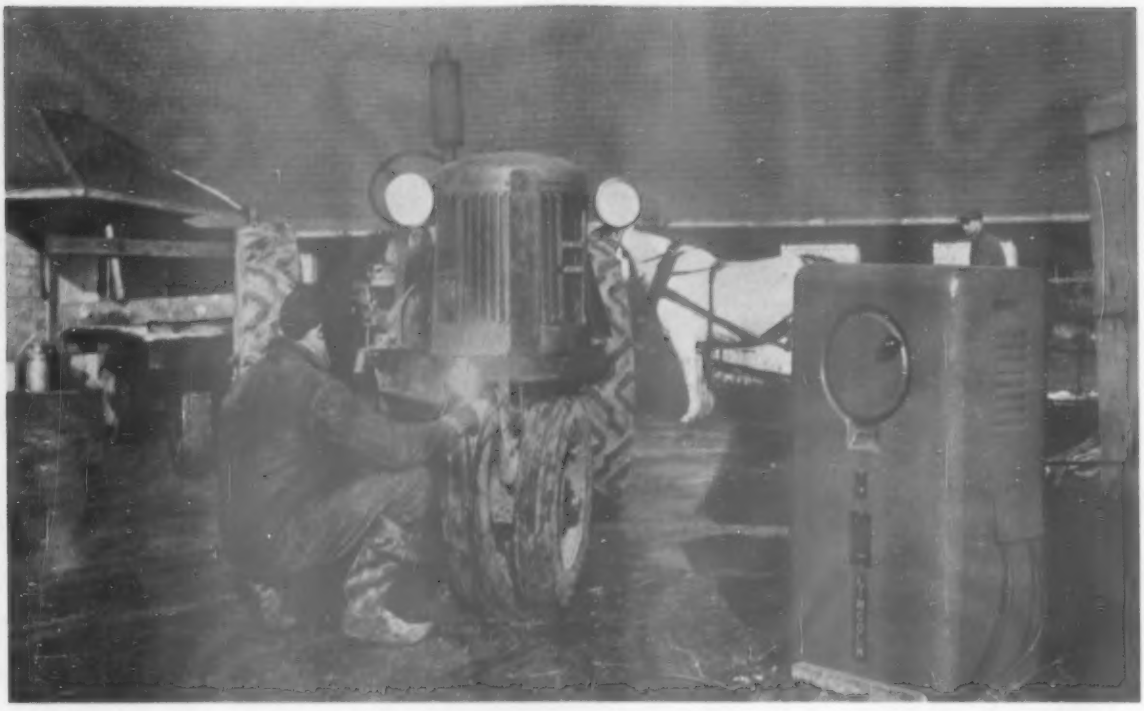
The qualified weldor is tested under Section Nine of the ASME code. The approved weldor, however, doesn't have to meet these same standards. This weakness in the repair code has caused failures, resulting in death and injury.

The National Board of Boiler and Pressure Vessel Inspectors has revised this code by deleting "approved weldors." It now reads "qualified weldors" only.

The Wisconsin Industrial Commission presently is studying this revision. If adopted, it will mean that all weldors fabricating or repairing boilers will have to pass a certification test.

All welding *can* be done under existing codes, and all manufacturers *can* have certified weldors *if* the codes are followed—thus assuring everyone concerned that welds will be as good as they know their weldors and procedure controls to be.

**BOILERS, tanks and pressure vessels demand the utmost care in welded fabrication. Weak welds may cause death and injury to many**

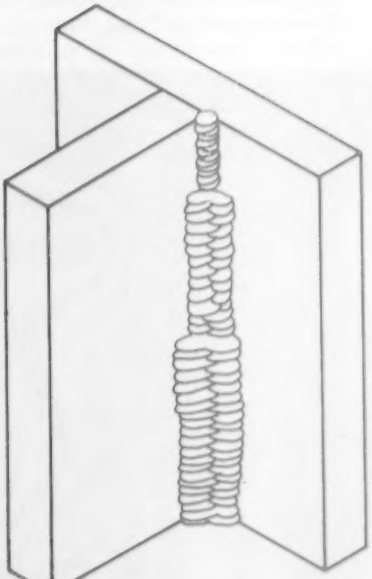


**FARM equipment, roadbuilding and other types of heavy machinery frequently are tack-welded for field repairs with E6011 electrodes**

*Third in a series*

# Filler metals for joining

BY ORVILLE T. BARNETT*



**TYPICAL lace pattern results when welding in the vertical-up position with E6011 electrodes**

WHEN E6011 electrodes were introduced in 1942, their proud designer-parents were sure that this lusty infant would someday be president of the electrode republic. E6010 electrodes had by then become three times as popular as all other types combined.

Since the E6011 group was not hobbled by being applicable with d-c alone, but would work quite well on a-c or d-c, this optimism seemed well founded. But time, the great leveler, has established E6011 electrodes as about the fourth most common classification, with annual consumption slightly over one quarter of the E6010 volume.

Still, with over two million pounds of electrodes a month going into weldments, the fourth place E6011 electrodes are obviously important.

In any controversy, from the prior creation either of the chicken or the egg down to the relative advantage of a-c over d-c for welding, emotion tries to overcome reason.

The advantages of a-c equipment are many, including freedom from magnetic blow, lower initial cost, lower operating cost and a better power factor. Yet d-c power sources continue to outsell a-c units, particularly for production welding.

## Cellulose in Coating

With a lower initial cost than the E6011 product, the E6010's also possess a superior d-c reverse-polarity performance. These factors have combined effectively to make E6011 electrodes as "dead as a dodo" in the field.

Both E6010 and E6011 electrodes are described as cellulosic types. This

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FIG. 1

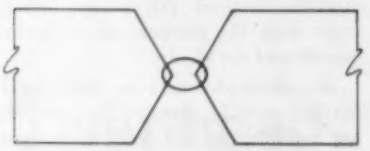


FIG. 2

**FIG. 1: Double-vee weld designed to eliminate back-chipping. A ⅛-in. gap is set for the first pass**
**FIG. 2: Single-vee weld made from one side without backing strip**

means their coating contains substantial quantities of something like alpha cellulose (found in *Kleenex* or, more recently, in some cigarette filters).

This substance burns in the arc to provide more than 300 volumes of hydrogen, carbon monoxide, water vapor and carbon dioxide for each volume of coating. As this gas billows away from the arc, harmful oxygen and nitrogen are prevented from contaminating the molten weld pool.

Titanium dioxide (the pure pigment rather than rutile generally is used) and magnesium or aluminum silicates (asbestos is common) provide arc stabilizers and a slag. Ferromanganese, another coating ingredient, deoxidizes and degasifies the molten weld metal as well as restoring some manganese lost during arc transfer.

For both E6010 and E6011 electrodes these coating ingredients are similar so far. But E6010 is a d-c reverse-polarity electrode only; the coating composition made it that way. The sodium silicate binder completes the common E6010 formulation.

E6011 electrodes must perform well on a-c where current flows full and ebbs away to nothing in the usual 60-cycle pattern. Potassium ions from potassium silicate or other potassium compounds and calcium-bearing chemicals give E6011 types required stability that leaves an ionized path to sustain and re-establish the arc when the power cycles through zero.

### Most Popular Size

Mixtures of potassium and sodium silicate are common. In Europe, where potassium silicate is less costly than sodium silicate, a-c arc stabilization with extremely "soft" arc action is normal.

The relative size popularity between E6010 and E6011 classifications can be interpreted in terms of applications. The 3/32-in. diameter E6011 is much more popular than the same size in an E6010. (See Table I)

Actually, this is the only size of E6011 that outsells E6010, and it is used largely in sheet metal applications as well as light-gage tubing and outdoor furniture. The same situation exists to a lesser degree in the ⅛-in. size.

Though field welding is almost exclusively d-c, large shops have shown a good acceptance of a-c welding. The tack-welding abilities of the E6011 electrodes prove advantageous in shop fit-up activities.

Tanks, from the relatively thin types specified for tank trucks to exacting pressure vessels, are constructed with E6011 electrodes. Quality, mechanical properties and chemical analysis are very high. (See Tables II and III.)

### Shipbuilder Consumers

Shipbuilding is another activity where E6011 electrodes are found in widespread use. After the war, shipbuilding declined almost to the vanishing point. Labor rates were prohibitively high and American shipbuilders needed new methods to survive.

Switching from d-c to a-c in some cases enabled shipbuilders to develop new welding standards. It would be nice to report a huge savings, because the E6011 product is much faster than the E6010.

Actually, a comprehensive study of hundreds of weldors doing ship construction for months disclosed no significant differences in productivity between the two cellulosic electrodes.

**SUGGESTED CURRENT RANGES FOR E6011 ELECTRODES**

| Diameter, in. | Amp | Volts |
|---|---|---|
| 5/64 | 30-65 | 22-26 |
| 3/32 | 30-80 | 22-28 |
| 1/8 | 80-120 | 23-30 |
| 5/32 | 120-170 | 24-30 |
| 3/16 | 140-220 | 25-30 |
| 7/32 | 170-250 | 26-30 |
| 1/4 | 225-325 | 28-32 |
| 5/16 | 275-450 | 28-32 |

Still, shipyards constitute a major customer for E6011 electrodes.

Steel mills often use heavy castings which are subjected to heat cycling. Many welds break in such service. However, the E6011's have given a good account of themselves. Where shop fabrication of such structures encounters many fillet welds with variable fit-ups and box sections, a-c procedures work best.

A review of a detailed welding design manual shows E6011 electrodes specified for the first pass of a gapped, double-vee weld of 1¼-in. minimum thickness. This joint was designed to eliminate back chipping (see Fig. 1 and 2).

In this example, a-c welding is certainly preferred because magnetic blow is almost inevitable. In fact, a-c welding can be used to eliminate back chipping even in thinner joints, e.g., for single vee-joints welded from one side without a backing strip.

### Best for Heavy Work

Farm equipment, roadbuilding and other types of heavy machinery are tacked together with E6011 electrodes. Infrequently, main-strength welds also are made with this filler metal.

Because of normal service abuse to

**Table I—RELATIVE SIZE POPULARITY OF E6010 AND E6011 ELECTRODE GROUPS**

| Diameter, in. | E6010 - % | E6011 - % |
|---|---|---|
| 3/32 | 0.5 | 1.9 |
| 1/8 | 14.1 | 17.7 |
| 5/32 | 41.7 | 33.4 |
| 3/16 | 34.6 | 35.7 |
| 7/32 | 2.1 | 4.3 |
| 1/4 | 6.2 | 5.8 |
| 5/16 | 0.8 | 1.1 |
| 3/8 | 0.007 | 0.0 |

Table II—TYPICAL MECHANICAL PROPERTIES OF E6011 ELECTRODE DEPOSITS—AS WELDED

| | |
|---|---|
| Yield strength, psi | 52,000—64,000 |
| Ultimate strength, psi | 62,000—77,000 |
| Elongation, % in 2 in. | 22—30 |
| Reduction of area, % | 35—55 |
| Impact strength, Izod ft-lb | 30—70 |
| Endurance limit, psi | 28,000—32,000 |
| Specific gravity, grams/cc | 7.84—7.86 |
| Corrosion resistance | Comparable to mild steel |
| X-Ray Quality | Excellent |

road and farm equipment, repairs with E6011 electrodes are quite common. Often, small a-c transformers are employed by road construction maintenance gangs or by farmers to repair their machines.

The same digging arc that penetrates the zinc surface on galvanized steel in characteristic cellulosic electrode fashion, goes through paint, rust and other dirt in maintenance work. Under such adverse conditions, E6011 electrodes lead to welds that are crack-free, fused well with base metal and able to stand up under severe stresses.

Techniques for E6011 electrodes will apply to E6010 types only when d-c reverse polarity is used. Undoubtedly, over 90% of all E6011 welding is done with a-c. For d-c work, reverse polarity is used for heavy welding and straight polarity is best for sheet metal work.

Short arc lengths yield best results. The arc may be formed by dragging the coating onto the work at a slight angle, pointing the electrode toward the molten pool for square-edge butt welds.

Grooved butt welds and downhand fillets are accomplished with a short arc. In all downhand welding, travel speed is determined by the heat capacity of joint and electrode.

Too much heat may cause burnthroughs or may char the last few inches of the coating. The weldor moves the electrode rapidly enough to keep ahead of the advancing molten pool.

### Preferred Methods

Horizontal fillets require a short arc to avoid undercutting. Sometimes a slight whip in the direction of travel and a circular motion may be employed, especially for larger fillets.

Welding upward when the weldment is vertical is recommended practice. A vertical oscillation is used to deposit the stringer bead in the corner, followed by horizontal weaving with a hesitation at each side for subsequent passes.

Pipe welding and sheet metal work frequently call for vertical downwelding, and are established exceptions to the "vertical-up" rule.

Overhead welding resembles horizontal fillet welding for basic technique. However, the molten pool is kept small to prevent molten steel from dripping on the weldor.

Occasionally, cellulosic weld beads will display surface holes or pock marks. This may be due to electrodes that are too dry, or to normal corewire variations. Usually such holes are shallow and do not interfere with subsequent pass deposition. Such welds are quite sound and gas-free.

Both E6011 and E6010 electrodes are "thirsty-coating" types. In humid atmospheres they pick up quite a bit of moisture. Because of a more alkaline nature, E6011's are more prone to moisture absorption.

### Moisture Damage

Proper storage in humidity-controlled storage areas is desirable. First in—first out usage sequences are ideal, although somewhat difficult to control.

Moisture pick-up in areas of moderately high humidity takes about six months to reach levels of around 6% moisture, as compared with an original 2 to 3%. Fortunately, excess moisture bothers the weldor much more than the mechanical or X-ray qualities of the weld.

Wet electrodes may be dried until performance is restored to normal, but overdrying will lead to porous welds and poor penetration. Cellulosic electrodes, like fish, thrive best with proper water conditions.

Where a-c welding is the rule, E6011 electrodes will be found in weldors' quivers. All major manufacturers make this type today, while in 1943 only about half the companies produced E6011's.

### Arc Stability

Tack welding, shipbuilding, pressure vessel and piping and sheet metal work—in fact, most shop work where a-c equipment is used extensively—depends to some extent on E6011 electrodes. The built-in arc stability so essential to a-c applications make sheet metal welding much easier.

The current ranges for E6011 electrodes are narrower than those obtained with E6010's, notwithstanding the heavier E6011 coating.

Producing flat fillet weld contours and coarse rippled beads, the E6011 electrodes have surely extended the application of a-c welding. Being useful with a-c and d-c equipment alike, they have been adopted for hundreds of quality applications.

Pointing out the fact that the E6011 never became the universal electrode some folks originally prophesied is like saying that the piano hasn't yet replaced the symphony orchestra. Probably it never will, but its usefulness is well established.

### REFERENCES


Manufacturers catalogs

*Tentative Specifications for Mild Steel Arc Welding Electrodes* (AWS Designation A5.1-48T—ASTM Designation A233-48T), June 7, 1948

*Weld Standards for Use in Applying WelDesign System*, Lincoln Electric Co., 1951

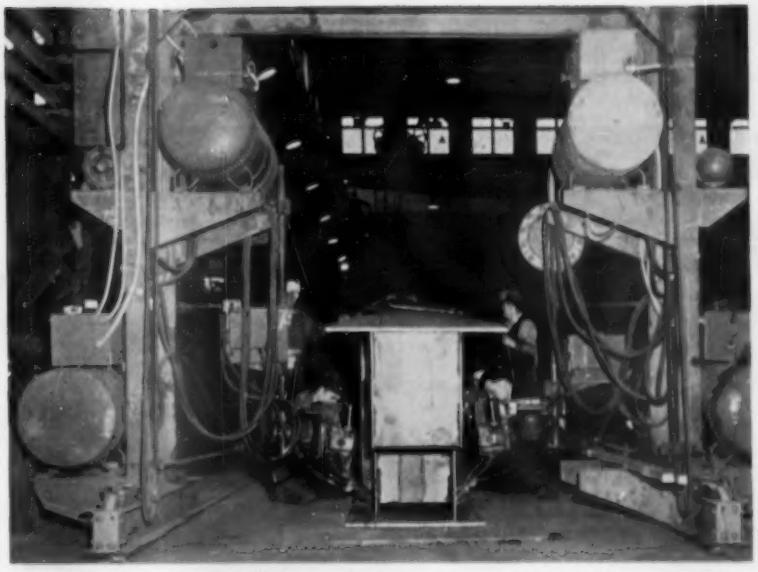

Table III—TYPICAL DEPOSIT ANALYSIS OF E6011 ELECTRODES

| Element | Core wire, % | Deposit, % |
|---|---|---|
| Carbon | 0.10-0.15 | 0.07-0.09 |
| Manganese | 0.40-0.60 | 0.21-0.57 |
| Phosphorus | 0.025 max. | 0.030 max. |
| Sulfur | 0.035 max. | 0.035 max. |
| Silicon | 0.03 max. | 0.10-0.21 |
| Copper | 0.15 max. | 0.15 max. |

# Twin heads

## cut welding time

BY R. L. BROWNING
*President, Victor Browning Co.*



**DETAILS of fixture allowing simultaneous automatic welding of girder sides can be seen as it nears the end of its run**

A SELF-PROPELLED fixture for welding, automatically and simultaneously, both sides of the cover to web-plate joints in box-girder crane beams has been designed by Victor Browning Co., Willoughby, Ohio, manufacturer of cranes and structural weldments.

The fixture drastically reduces overall handling and welding time of this operation, which previously was a manual one.

A gantry fixture mounts two automatic submerged-arc welding heads with necessary d-c generators and control equipment. The 600 and 300-amp generators are connected in parallel.

A small hand crank is used to position the welding heads properly against the joints. The arm on which the heads are mounted has a weight attached to give the heads added stability while the gantry is in motion.

Two small, spurred wheels, between which the welding wire emerges, make contact with the base and upright portions of the girder and insure a constant, straight-line weld.

### Self-Propelled Gantry

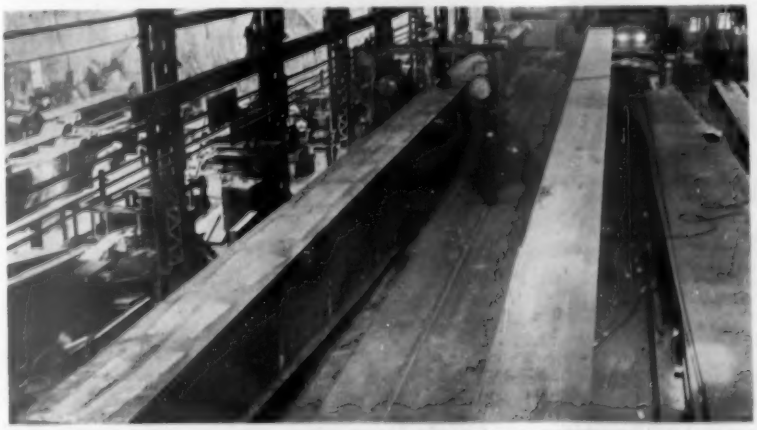
The gantry mounting all this equipment rides on two rails, between which is placed the box girder to be welded. It is driven by a motor, mounted on top of the frame, which belt-drives a shaft supplying power through chains to drive wheels on both sides of the gantry.

In making box girders, steel plate is first flame-cut to size. The webs and cover plates are made in two sections, which are welded together with manual semi-automatic equipment to form required lengths.

These fabricated plates are set up and tack-welded to form the box girder, which then is positioned between the gantry rails for final welding.

The girder shown is a box section for a 15-ton crane. Made of A7 structural steel, the girder is 123 ft long and weighs about 18 tons. Its webs are $\frac{3}{8}$-in. plate. The cover plates are $\frac{3}{4}$-in. thick.

The fillet joining these plates is welded in three passes with a 3/16-in.-diameter wire. With the submerged-arc automatic process, no edge bevel is necessary. Welding current is 760 amp at 37 volts, with a travel speed of 28 in. per minute.



*—Photos courtesy The Lincoln Electric Co.*

**GANTRY frame mounting dual submerged-arc welders nears the middle of a 123-ft box-section girder. Travel speed is 28 ipm**

### Crane Lifts Beam

Since the bottom of the beam is curved, and the welding head follows a straight horizontal line, the beam must be adjusted slowly as welding progresses to keep the joint level. This is done by lifting one end of the beam with an overhead crane, then slowly lowering as welding progresses to the center of the beam.

When one-half of the beam is completed, the overhead crane moves to lift the other end as welding continues. The entire beam is then inverted and the top cover plate is welded in a similar manner. The cover plate is welded with a $2\frac{3}{4}$-in. camber.

FIG. 1: The transverse cutting nozzle is mounted on a carriage powered by a small electric motor. A ball-type conveyor bed supports the plate. Control panel is at right

FIG. 5: Twin nozzles remove flanges of excess material after circular steel plates have been pressed into heads

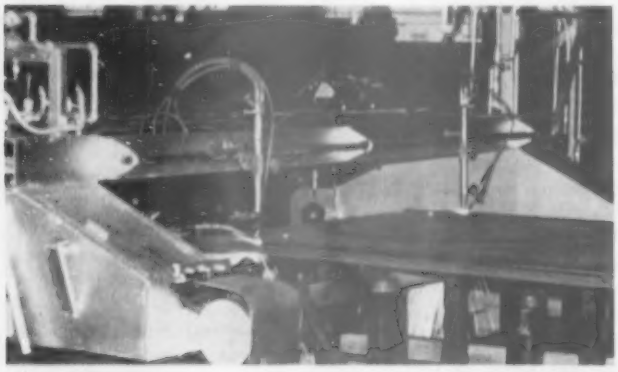


FIG. 2: Longitudinal cutting nozzles are mounted on main frame, which is driven on rails by a geared motor unit. Wheel span of the main frame is 13½ ft

FIG. 3: A test coupon of steel is cut transversely. Pilot which lights gas automatically is attached to the cutting torch. On machine, a water flow washes slag into pits at end of conveyor bed

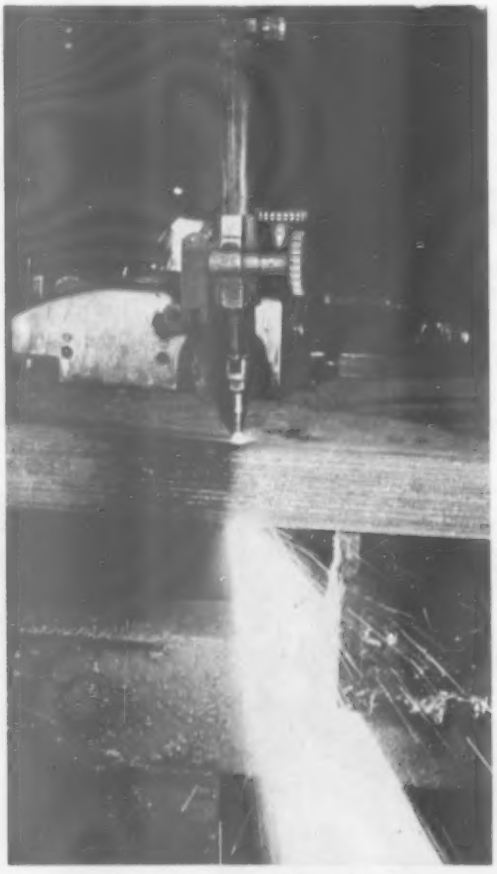


FIG. 4: Flame-cutting machine works its way in a circular cut on a stack of steel plates. Thickness of stack may vary from 3¼ to 5 in. Maximum cutting time is 35 minutes

# Steel mill finds many uses for oxygen, acetylene

BY RAYMOND KOPECKY*

THERE are literally dozens of uses for acetylene and oxygen in a steel plant.

Recently, Sheffield Steel Corp. of Houston, Texas, began rolling heavy plate. The plates varied in thickness from 1⅜ in. to 2⅛ in. Since our plate shears would handle plates up to a thickness of 1¼ in. only, the cutting of heavier plates had to be accomplished by other means, preferably by use of acetylene and oxygen.

After talking with a manufacturer of flame-cutting equipment, we decided to design and build a flame-planer to do the job. With the technical help and the equipment this firm could supply (drives, carriages, blowpipes and nozzles), we constructed a heavy plate flame-planer that we feel is the latest in its field.

Speeds of both longitudinal and transverse cuts are controlled by electronic governors to give very sensitive adjustments of cutting rates. Acetylene and oxygen gas flows are controlled by solenoid valves operated by relays which, in turn, respond to buttons on the control panel.

The machine also has pilots at each of the three nozzles for automatically lighting the acetylene gas.

### Cutting Nozzles

Fig. 1 shows the transverse cutting nozzle and carriage that is driven by a small electric motor through a pinion and rack. The control panel is at right, and a ball-type conveyor bed supports the plate.

A view of the two longitudinal cutting nozzles is seen in Fig. 2. They are mounted on the main frame, which rides on rails and is driven by a geared motor unit. The bridge wheel-span of this main frame is 13½ ft.

A close-up of a transverse cut on a test coupon is afforded in Fig. 3. The pilot for automatic gas lighting is mounted on the cutting head. Slag is removed by water which washes into pits at either end of the conveyor bed.

The cost of this machine, compared to that of a heavy plate shear designed for the same job, was approximately 75% less.

Two very important applications of oxyacetylene flame-cutting are made in Sheffield's tank head department. The first is the preparation of material for hydraulic presses. The plates are brought to this department in rectangular sections and cut into circular sections in a process called "stack cutting."

Fig. 4 shows the cutting machine in position and operating on a stack of plates. The number of plates varies from 12 to 16, giving the stack a thickness of 3¼ in. to 5 in. A stack of these plates, 60 in. in diameter and 5 in. high, can be cut to required circular shape in 35 minutes.

### Removal of Flanges

The second application takes place after the plates have been pressed into heads. When these heads come from the press, they have excess material ("flanges") that must be removed. These flanges are flame-cut on a rip-trim cutting machine.

This machine (Fig. 5) has twin nozzles mounted horizontally 1½ in. apart, with one nozzle a little higher than the other. The preheat period, which takes seven or eight seconds, is controlled by the operator.

Following preheating, the cutting oxygen is turned on manually. This same switch also starts the turn table rotating the work against the cutting nozzles.

The first nozzle heats and rips the tank head at the point of cut while the second nozzle trims the cut and causes slag to break loose easily. This twin nozzle arrangement gives both a very smooth edge and a fast cutting operation. An operator can complete one piece of work in three minutes.

### Flame-Cleaning Castings

In a small foundry in the open hearth department, all the castings used on the open hearth furnaces are

*Maintenance engineer, Sheffield Steel Corp., Houston, Tex. This article is based on a paper presented by Mr. Kopecky at the 1955 Annual Convention of the International Acetylene Ass'n. in Houston.

cast. These castings are made both of cast steel and cast iron from the blast furnaces.

When the castings are removed from molds, they must be cleaned by cutting off excess metal. For steel castings the standard oxyacetylene cutting torch is used. The powder-cutting torch is used on cast iron material.

Also within the open hearth department are other important uses for acetylene and oxygen. Scrap preparation certainly is one of these. Most of the steel scrap purchased is small enough to be charged directly into the open hearth furnace. However, some of it is too large and must be cut into smaller pieces.

This small percentage of total scrap includes some recovered within our own plant, such as obsolete machinery and old railroad rails. With flame-cutting equipment—hand torches, in this case—this scrap can be reduced to usable size without any difficulty.

The oxygen lance used for tapping the open hearth furnace is a necessary tool in steel production today. It is a vast improvement over the old method of ramming the ceramic plug out of the tapping hole. This hole now can be cut open in a minute or so, giving better quality control and greater safety.

### Cutting the Spill

Every now and then, an open hearth furnace will be over-charged. When this occurs, the ladle and cinder pot are unable to hold all the material coming out of the furnace.

Since this "spill" hinders future tapping operations, it cannot be allowed to accumulate. The spill contains slag material, and can only be removed by cutting the solidified material into small pieces with a powder-cutting torch.

A similar project of larger proportions was undertaken several years ago. An open hearth furnace suffered a break in its front wall, allowing approximately 150 tons of molten steel to escape under the pit side of the furnace.

This spill contained slag and refractory material and, in certain areas, solidified at a depth of 37 in. To the powder-cutting torch, however, this proved of little consequence. The entire spill was cut into small pieces and removed within seven days.

An interesting application of the flame-cutting machine to rolling mill production occurred when a bloom shear broke down for four days. Production was badly needed at the time.

**SHELL steel billets, 5¼-in. square, could not properly be cut with a billet shear. Flame-cutting torch with automatic positioner mounted over a rolling table completes the operation in 54 seconds**

### Emergency Set-Up

A manufacturer of oxyacetylene equipment suggested a method of flame-cutting the rolled shapes, and supplied a standard cutting machine, along with the auxiliary equipment needed for this particular set-up. The complete unit was mounted on the roll table side-guards, with the cutting nozzle positioned over the center of the table.

With this installation serving as a substitute for the bloom shear, and by scheduling the blooming mill to roll small sections, production at 80% of full capacity was maintained for four days.

To achieve a finished product of good quality, the surfaces of rolled blooms and slabs must be conditioned before further rolling in the finishing mills. This surface conditioning, more often than not, is accomplished with the help of the oxyacetylene flame.

A hot scarfing machine, installed in the rolling line on the delivery side of the blooming mill, removes rolled-in scale and shallow cracks on all four sides of the alloy steel blooms as they proceed from the breakdown mill to the finishing mill.

### Plant Supply System

Sheffield maintains a centralized system for plant acetylene and oxygen supply. A bank of four 500-lb acetylene generators supply approximately 85% of the acetylene used, while the remaining 15% is furnished in cylindrical containers by an outside supplier.

The oxygen supply unit has a capacity of 310,000 cu ft of liquid oxygen. From this source, approximately 95% of the oxygen used in the plant is received, while the remaining portion is made up of oxygen in cylinders. Gases from central units are piped throughout the plant with outlets located at points where larger amounts are needed.

The cylinders of gas are used by maintenance personnel in their routine work of keeping the mills in operation—providing gas uses too numerous to describe here.

Any piece of work that would require a great deal of time if placed in an automatic flame-cutting machine is given preliminary treatment in a burning shop. Here, both hand and machine torches are used to cut larger pieces of metal to more approximate dimensions before final cuttings in the main machine shop.

Jobs that sometimes seem impossible are being done—often very easily—with the help of acetylene and oxygen flame-cutting and flame-cleaning equipment. These gases are being used practically everywhere in any modern steel mill.

They are being used so widely, in fact, that the writer wonders how steel workers managed to carry out their duties before the advent of acetylene and oxygen.

*A West Coast manufacturer of electric household hot water tanks has found that . . .*

# Mig welds are a competitor's best friend

BY W. L. WYMAN*

COMPLETE water tank welding booth. A simple rolling jig brings tank heads quickly into welding position beneath automatic Mig unit

PRODUCTION of electric household hot water tanks is a highly competitive field, and reduction of manufacturing costs in this industry, as in most others, is always the goal of the production department.

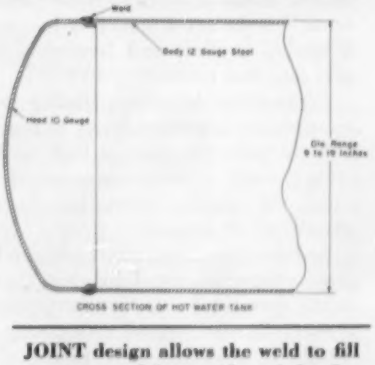
Development of the automatic Mig (metal inert-gas) unit for mild steel welding has proved to be a shop tool that permits reduced production costs in a period when most operating costs are increasing steadily.

Factors that make this possible are high-speed welding and the elimination of several production stages. Labor and overhead are reduced 65% on joints where the Mig process is used. Also, one man using an automatic Mig unit can replace three stick-electrode weldors.

A secondary benefit of Mig welding is the uniformly excellent weld appearance as compared to stick electrodes.

At Collins Concrete and Steel Pipe Co., Portland, Ore., elimination of several production stages has been accomplished. The application of spatter-proofing no longer is necessary with the Mig process. Secondly, slag-free Mig welds eliminated the need for costly slag removal.

The illustrated chart shows a cost comparison of the Mig process with the stick electrode on that portion of the tank now being welded by the automatic Mig process. Such factors as reduced shop space, less handling and fewer production operations, while very important to the manufacturer, are not considered in this comparison.




JOINT design allows the weld to fill a groove and leave sides of the finished product almost flat. Tanks are galvanized following welding and testing

There is a saving of $0.35 per tank welded and, on an average monthly production of 1,600 tanks, this firm saves $560.00 in direct production costs.

The hot water tanks are welded with a current of 360 amp at 26 arc volts. A 2% oxy-argon shielding gas mixture is used at the rate of 39 cu ft per hour. The welding speed of 41 in. per minute uses 1/16-in. wire at 175 ipm.

About 700 lb of wire presently is used per month by the firm, and it is felt that future expansion of automatic Mig welding on gage-thickness mild steel is sure to develop.

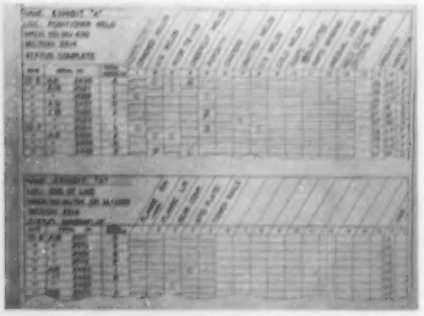
*Technical representative, Air Reduction Pacific Co., Portland, Ore.*

COST COMPARISON

(Two Circumferential Welds Joining Heads To Tank Body)

| AUTOMATIC MIG | | | | STICK ELECTRODE | | |
|---|---|---|---|---|---|---|
| Shielding Gas 2% Oxy-Argon 39 cu ft per hour | Wire A675 9.36 lb per hour | Labor and Overhead $3.00 per hour | MIG Cost per tank | Electrode Cost per tank | Labor and Overhead $3.00 per hour | Elect-E 6012 |
| 1.61 cu ft per tank | 0.39 lb per tank | 0.0625 hr per tank | $0.51 | $0.86 | 0.25 hr per tank | 0.8 lb per tank |
| $0.18 per tank | $0.14 per tank | $0.19 per tank | | | $0.75 per tank | $0.11 per tank |

INERT GAS at $0.111 per Cubic Foot
WIRE at $0.34 per Pound
ELECTRODES at $0.14 per Pound



FLOOR control chart samples indicate broad range of inspection

# Quality control:

BY E. C. OSBORNE*

How many times have you tried to explain what quality in your product means?

It is your biggest selling point, but to put it into words and get it across to a customer is no easy job. It is difficult to explain to a customer, who usually thinks in terms of dollars and cents, how he saves money in buying a quality product and how quality gets into that product.

Competition is making quality an increasingly important factor in business. In many instances, a high mortality results among businesses because the quality factor has been eliminated or ignored.

Anyone can turn out junk, and some companies are doing just that in the mistaken belief that the public is generally unconcerned with quality. Within a relatively brief period of time, however, these "short-term" producers find that survival is closely dependent upon a reputation built on quality.

Modern trends toward increasing machine complexity appear to make the quality problem more complex than it might have been in the early custom shops. We are fortunate that modern control methods have been growing with machine complexity. Alert management can now meet this demand at lowest cost with a sound "quality control" program.

## Just What Is It?

What is quality control? Some manufacturers are of the opinion that through some hocus-pocus we have available a tool whereby we can market a higher-quality product and receive a bonus for doing so through lower costs.

The promise sometimes is irresistible, and too often we plunge headlong into a morass of data, charts, reports and arguments, with no noticeable quality improvement and a disheartening realization that we have added nothing but overhead expense.

Evidently one ingredient must be cultivated to assure the success of the general quality-control endeavor. This cementing ingredient is a plant-wide realization of the importance of quality and the modern means for achieving it.

It can be tied to job security, to pride in workmanship, to profits. A common term for this ingredient is "quality-consciousness," although it might be called more appropriately a "quality philosophy."

Once quality becomes everybody's job, the organization may be expected to make a helpful contribution in many diverse phases of a plant's operation. Therefore, to be successful, it can never limit itself solely to statistics.

Of course, there must be a system of control over the thousands of operations performed in manufacturing our products. In the past, inspection systems were set up with men located at strategic points to separate the good from the bad. In recent years new thinking, new developments and new techniques have arisen in the inspection field—just as we have seen new developments in engineering.

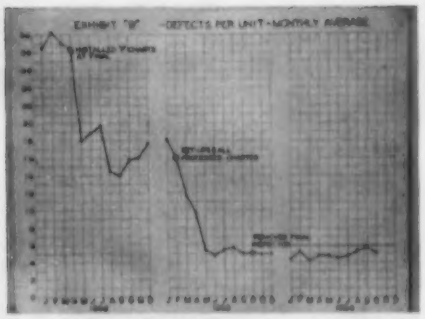
## Applied to Welding

This subject of applying quality control to welding is a most confusing one, primarily because most quality control people seem to ignore the hidden factors involved in welding procedures.

FOREMAN keeps a running check of a welder's work on a chart located near the job site

*Quality control manager, Caterpillar Tractor Co., Joliet, Ill. From a paper presented at Midwest Welding Conference at Armour Research Foundation, Chicago.

# a welding 'must'



**MANAGEMENT chart is graphic proof of operation's success**

During the past several years, I have attended quality control sessions throughout the Midwest and have had lengthy discussions on *chart control* with people prominent in this work. But very few have been ready to sit down and discuss mutual *welding* problems.

Quality control can only point out whether a process is being held within predetermined specifications or limits. Corrective action by the operator must be taken promptly to determine and eliminate causes for disclosed defects, variations or rejects. Quality control must mean more than simply gathering data, applying mathematical formulas and making charts.

Inspection alone is not quality control. Control is direction by someone who exercises sound judgment and who has the ability and authority to take corrective action when necessary.

We are beginning to keep a score card on our welding activities. We establish our goals and work towards them. We check our progress and measure our performance. But it is not enough for supervisors and quality control personnel to have targets. We must have individual targets for the men who run our machines and work on our assembly lines.

Those of you who play golf know what I am talking about. You might not get a hole-in-one, but you keep trying. You try to improve your score. That's one of the main reasons you enjoy golf. But if nobody kept score and you just clubbed the ball around, you wouldn't be very interested in your performance.

## Chart Control

That's the way it was with a man working before chart control was introduced. He went along for days and weeks—yes, even months—turning out the same identical part. His work was inspected. Some of his output was accepted, and some was rejected.

He didn't know whether the rejections were his fault, the fault of the machine or the material. He didn't know how his output compared in quality to that of the man across the aisle. In other words, "he didn't know the score." And since he didn't know the score, how could he possibly have any real interest in his performance?

But, put a score card on that man's activity and watch the difference.

This score card is the control chart. It might be compared to a highway with shoulders and a ditch on either side. If your car gets on the shoulder it's a caution. If you hit the ditch it's too late.

On a control chart the control limits are the shoulder, and the blueprint dimensions are the ditch. Group samples are taken at regular intervals, and their average dimension is plotted on the chart.

As long as the plotted points fall between the control limits, the parts meet specifications. If they fall outside the control limits, but are still within the blueprint lines, it means the job is going out of control. Forewarned by this tendency, we can take corrective action before too much damage is done.

Quality control stimulates thinking and puts a man in the right frame of mind for quality production. Chart control gives him a quality score on his activity. It also gives him a feeling of team security.

Chart control will also show that poor quality is not always the fault of inferior workmanship. Sometimes the tools are at fault, or the machine needs repair, or the material is wrong, or the wrong technique is being applied. In short, management may be at fault for not providing the best and most efficient equipment for the job.

When chart control brings conditions like these to light, and management promptly corrects them, the worker will have confidence in his supervisor. He will be inspired to do his share—to do the kind of work he and his employer will be proud of.

It is necessary to control each and every shipment received in the plant, whether it is a casting, forging, rough steel, steel bars, or purchased finished items.

## Procedure

When material such as steel plates, angles, special rolled sections or any type of rough steel is received, it is unloaded in a "hold bay" and remains in that location until approved by the quality control department. When the necessary papers are originated to receive the item, dimensional checks are made and plotted on a chart, metallurgical samples are taken, physical and chemical analyses are run and plotted on a metallurgical laboratory chart.

The material is then released to the inspection division, which is responsible for painting code colors and permanently identifying the material. It is then released to the material control division for distribution to the factory in quantities needed for a production schedule. This indentity remains with the steel until it is fabricated and used in assemblies and prime products.

From this point on, what kind of weld we get depends entirely on how well we control our shears, brakes and punching operations. If they are not controlled, we have poor fit-ups which do not lend themselves to good welding practices in anyone's factory.

All scale dimensions are studied by the quality control analyst and recommendations made to our engineering department concerning what type tol-

*(Continued on page 46)*

**Above is the finished product resulting from a top-to-bottom change in this company's production scheme. The series of pictures below illustrate some of the new fabrication steps, which include both brazing and soldering.**

# Copper contacts formed faster

BY CORWIN S. SELBY*

BERYLLIUM-copper "short" contacts for electronic oscillators formerly were "hogged" out of solid slugs. Cost of the operation was very high, and the life of these machine-fashioned rings was short.

Experimentation indicated that a solid silver overlay on the "finger" ends lengthened ring life, but added a burdensome cost factor.

Development of a new process, however, has cut fabrication time 80%, and has improved wear life and electrical characteristics.

Beryllium-copper extrusions, 0.006-in. thick, provided the answer. Costly hogging was eliminated as 1½-in. lengths of the metal were rolled into a rigid cylindrical shape over which silver-wire rings could be slipped for soldering.

The silver-wire rings, which could not be soldered to a flat strip of beryllium-copper without buckling, are square cross-sections cut from a 1/16-in.-thick tube and sized on a tapered mandrel. They will become overlays bonded on the ends of the contact fingers for longer life and better contact.

For the brazing process, the contact cylinder is positioned over a brass collar. Silver rings are placed on the cylinder, fluxed and then positioned along with preformed silver brazing rings. The whole unit is fluxed again to insure thorough distribution of the brazing alloy and is set upright on an asbestos pad to retard melting of the lower brazing ring.

**1—PRIOR to brazing, silver rings are placed on the contact cylinder, fluxed and then positioned along with preformed silver brazing rings**

**2—ASSEMBLIES are brazed, two at a time, in a furnace at 1,450 F for 60 seconds, then immediately quenched for annealing. Following brazing, the rings are snipped and rolled flat for slitting**

*Assistant production manager, Hewlett-Packard Co., Palo Alto, Calif.

## Brazed and Annealed

Assemblies are brazed, two at a time, in a furnace at 1,450 F. Brazing requires about 60 seconds, and assemblies are immediately quenched for annealing.

Following brazing, the brass collar is knocked out of the assembly with a mallet, and the rings are snipped. This can be done accurately enough with tin snips since the ends will be squared later. Split assemblies are then rolled out flat in preparation for slitting.

In this operation, eight strips are grouped in pairs in a packing fixture and slotted with a saw on a horizontal mill. Fixture bars in the mill are slotted top and bottom for slitting both edges of the strips.

Cut longitudinally, the strips are then re-rolled into a circle in an adjustable fixture. A variety of contact sizes can be made from the basic strip, but all have a cone shape.

The "fingertips" — the serrated edges of the cylinder—are bent outward in an arbor press. Contacts are then degreased and, if necessary, destained by a 15 to 60-minute immersion in a 10% sulphuric-acid solution.

The shaped and cleaned assembly is now ready for the hardening process. Placed in a die to hold its shape,

the contact ring is set in a 6 by 8-in. stainless steel pot, which has a lid fixed by means of a center stud.

### Inert-Gas Purge

In the base of the pot is a copper preheating coil through which an inert gas (95% nitrogen, 5% hydrogen) is fed at 10 liters per minute to force out air. After the lid is sealed, the gas is fed in at 1 to 2 lpm, bleeding through a 1/32-in. hole in the lid.

Placed in an electric oven at 600 F, the pot is left there for 3 to 3½ hours for hardening, depending upon contact ring size and hardness desired. The pot is then removed and allowed to cool for a few minutes as the gas continues to flow. Cooling can be hurried by outside application of a wet cloth.

Following hardening, the inner and outer contact rings, the two brass discs on which they are assembled, and soft-solder preformed rings are flux-coated. The parts are then assembled over the inner contact ring. The outer contact ring is snapped on last and held by one of the solid base rings.

Solder preforms are placed inside the assembly at the joints of contact rings and upper disc. Soft solder is used for this assembly, so previous brazing is not affected.

### Soldering Is Critical

Discs are brought to the base and squared with the rings by placing a collar over the assembly and tapping with a plastic hammer on a level surface.

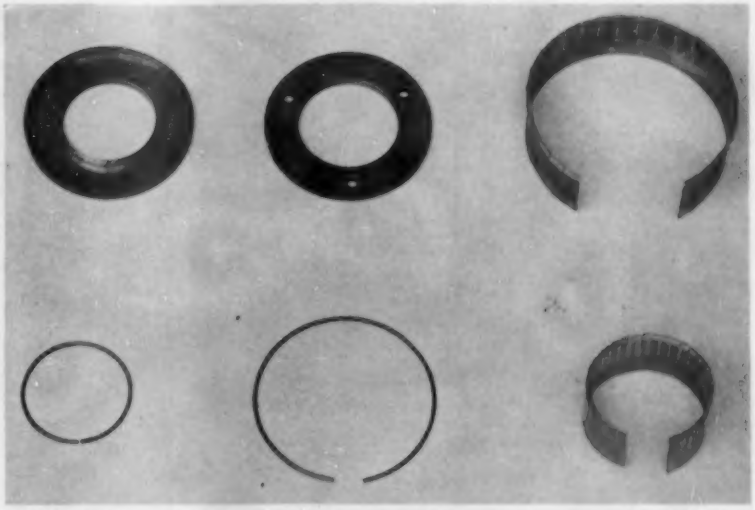
The assembly is placed in an induction heating coil and brought to 450 F only in the zone of the disc to avoid flowing of silver on fingertips. Soldering takes only 20 to 30 seconds, but is a highly critical operation because of the fingers. If heat reaches the tips, current is momentarily turned off to hold distortion to a minimum.

Contact assemblies must be honed to bring the silver fingertips back to circular shape. The assembly is held on a "spider" by bolts through holes in the ring's baseplate. The spider is gripped in a drillpress chuck and rotated at 32 rpm over a honing fixture built into a table.

As the drillpress spins the spider and its attached assembly, the honing fixture reciprocates vertically at 172 rpm. Reciprocation is produced by a ratio motor operating an adapter that ordinarily converts a portable drill into a saw.

Outer honing stones are 0.004 to 0.006 in. smaller in ID than the OD of the fingers. Inner stones are the opposite, so the fingers are compressed for accurate honing.

Honing takes about four minutes, the spindle rotating for two minutes each way. Lard oil and kerosene lubricate and float off silver particles. Formerly, hand-lapping with a scouring powder took 15 to 20 minutes, frequently resulted in damaged fingers, and gave rounded surfaces with poor contact.



**MAJOR elements of the beryllium copper "short" contact assembly include two brass discs formed with mating flanges, two contact "finger" rings and two solder preforms**

**3—AFTER slitting, shaping and cleaning, the assembly is placed in a die, then in a stainless pot for the hardening process. This is done at 600 F for 3 to 3½ hours depending upon hardness desired**

**4–HARDENED parts are fluxed and assembled, together with soft-solder preformed rings, over the inner contract ring. The outer contact ring is snapped on last and held by a base ring**

**5–SOLDER preforms are placed inside the assembly at the joints of contact rings and upper disc. After soldering, contact assemblies must be honed to bring fingertips to circular shape**

HARDFACING process designed to operate as a machine application, using a converted straight-line cutting machine

SHOP-WORN production gage receives a manual application of powder alloy during hardfacing process

# Hardfacing production gages

BY JACK FAIRLIE

THE SALVAGE of costly production gages, effected recently by the Toledo (Ohio) Division of Dana Corp., can be traced directly to the development several years ago of a powder-spray process for silver soldering and high-speed brazing.

Frank R. Strate of Buffalo, N.Y., was the man responsible for this method, which later was used to advantage in applying a hardfacing powder alloy to such metals as stainless steel, nickel chrome, cobalt and tungsten carbides.

It is this later refinement of the process that is presently employed by the Dana Corp., and by another Toledo firm, Odland Iron Works, Inc., which actually pioneered in the use of the process. The powdered alloy, an austenite, martensite and carbide compound, is applied to metal through the torch tip.

Carried by a rubber hose from a nearby hopper, the powder spray is controlled by the torch operator.

## Inert-Gas Carrier

Taped to the torch handle is a small microswitch that energizes a vibrator in the powder hopper and starts the flow.

An inert gas, either carbon dioxide or argon controlled by a flow meter, forces the powder through the hose. Regulating both rate of vibration and inert gas flow, and setting them in proper relation to torch travel speed, provides a good control over thickness of the alloy deposit.

When metal is preheated to a "sweating" temperature, the microswitch is pressed to start the flow of powder. Three ounces of the powdered alloy will cover 11.05 sq in. of metal to an approximate depth of 0.04 in. Material cost for this operation would average $0.10 per sq in.

For small, rounded parts where only a fine facing layer is desired, prior blasting with aluminum-oxide grit prepares the surface for a thin deposition. Parts must be kept exceptionally clean and gas-carrier pressure increased in this instance.

## Economical Discovery

The process was first used on gages which had been worn below production standards. A salvage team ground an additional few thousandths of an inch from the worn faces and applied the hardfacing alloy. The rebuilt gages were then ground down to meet production requirements.

An interesting and, for the user, profitable result of experience gained during maintenance use of this process was the discovery that new gages could be made from a cheaper base material and given a hard alloy facing.

A microstructure of an alloy application on both tool steel and a carburizing grade of steel indicated good fusion with no porosity. This, the manufacturer feels, would tend to indicate the advisability of expanded hardfacing applications.

Inspection gages might be made with this process, and it may be given some application in actual production.

SOME of the many production gages salvaged through use of the spray-powder hardfacing process. Gages also are manufactured with this process

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No. 5000 ATTACHMENT

A FIBRE-METAL EXCLUSIVE!

NEW No. 5000 "SPEEDY" ATTACHMENT...

1) Converts Welding Helmet to Safety Cap Use
2) Readily Adapts to Caps in Field
3) Fits All Popular Peak-type Caps
4) Attaches or Detaches Cap Instantly

THIS INGENIOUSLY DESIGNED, *yet simple to use,* "SPEEDY" Attachment adapts the welding helmet for use with a Safety Cap to provide *both* eye and head protection for the Welder when he works under conditions where there is danger of head injury from falling or flying objects.

"SPEEDY" is economical both as to cost and in speed of attachment . . . or detachment! It represents very practically FIBRE-METAL's long experience and ability to provide the best possible *products for protection* that also help make the most profitable use of a man's time.

The No. 5000 "SPEEDY" Attachment consists of two rugged steel Clips with insulated prongs to grip the edge of the Safety Cap; a sturdy, replaceable Neoprene Strap connecting the Clips and providing tension over the top of the Cap. Friction joints hinge helmet on cap. Write for Bulletin No. 43.

No. 5000 "SPEEDY" FEATURES:

- LONG LIFE: ECONOMICAL, PRACTICAL
- SPEEDY ON OR OFF
- FITS ALL POPULAR PEAK-TYPE CAPS
- NO HOLES IN CAP
- NO HARDWARE ON CAP
- CONTINUOUS HEAD PROTECTION
- ADAPTS PRESENT HELMETS TO COMBINATIONS

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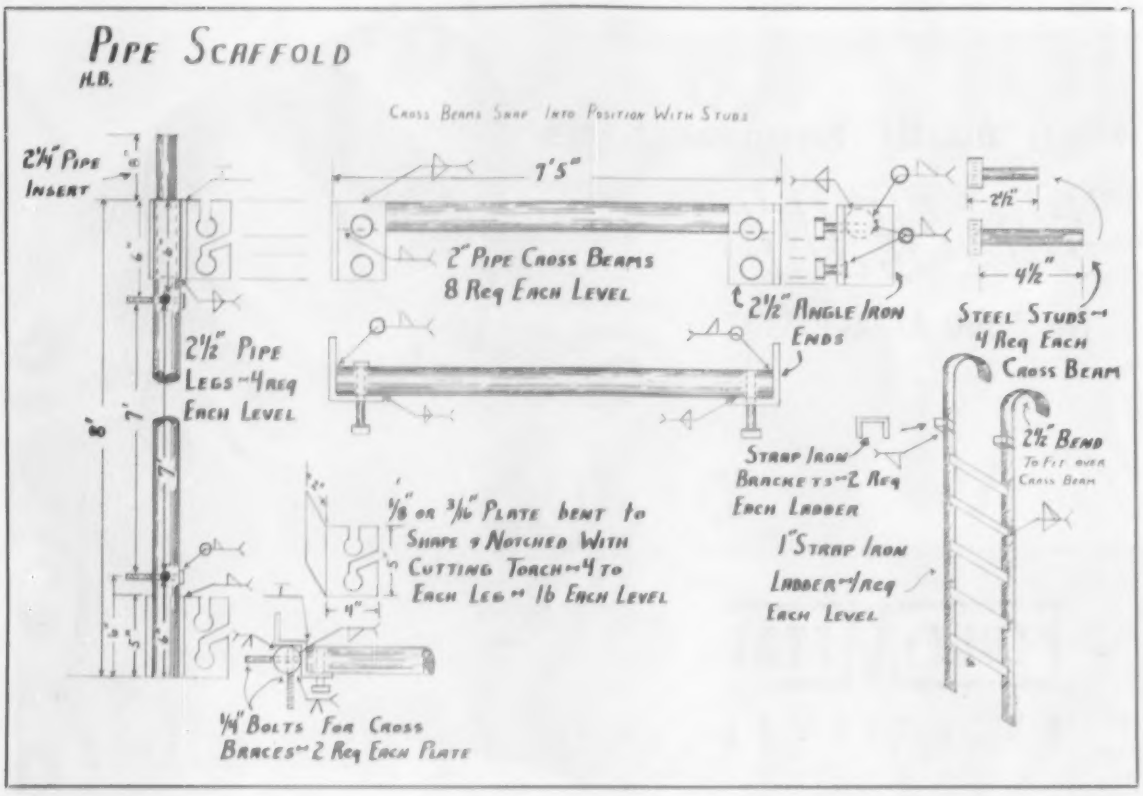

PIPE SCAFFOLD
H.B.
CROSS BEAMS SNAP INTO POSITION WITH STUBS
2¼" PIPE INSERT
7'5"
2" PIPE CROSS BEAMS 8 REQ EACH LEVEL
2½" ANGLE IRON ENDS
2½"
4½"
STEEL STUBS — 4 REQ EACH CROSS BEAM
2½" PIPE LEGS — 4 REQ EACH LEVEL
2½" BEND TO FIT OVER CROSS BEAM
STRAP IRON BRACKETS — 2 REQ EACH LADDER
1" STRAP IRON LADDER — 1 REQ EACH LEVEL
⅛" OR 3/16" PLATE BENT TO SHAPE & NOTCHED WITH CUTTING TORCH — 4 TO EACH LEG — 16 EACH LEVEL
¼" BOLTS FOR CROSS BRACES — 2 REQ EACH PLATE

# Welded scaffold

BY HOWARD E. BOYLE

THE accompanying diagrams illustrate how you can construct a welded, portable, break-down scaffold for use in construction or maintenance. One like it was built by the author in his welding shop.

Four men can rapidly assemble or disassemble this scaffold, and its component parts can easily be stored.

The legs are made of 2½-in. pipe, 8 ft long. Four legs are required for each level. Inserted into the top of each leg is a 2¼-in. pipe about 8 or 10 in. long.

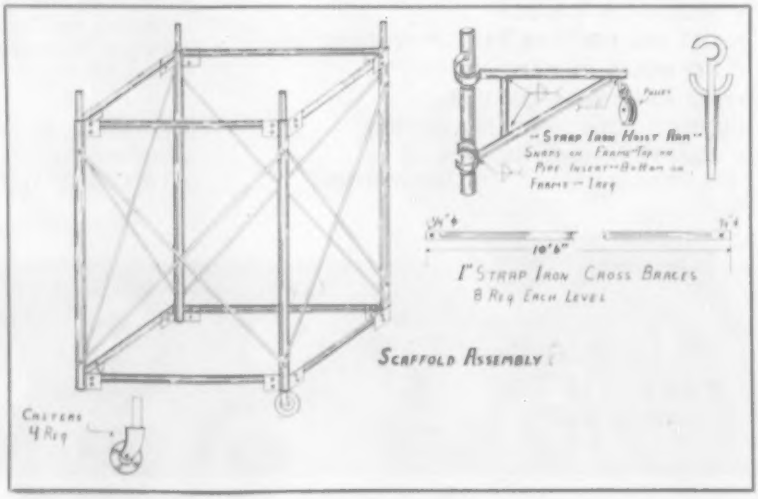
It may be necessary to drill several holes through the leg and the insert for bolts to anchor the insert to the leg, but a good flush weld all around will hold it better. Only the tops of the legs have these smaller inserts.

Cross beam plates are made of ⅛-in. or 3/16-in. plate and are cut and bent to shape as shown in the drawing. The holes and slots are cut with an oxyacetylene torch. It is a good idea to make all the cross beam plates at the same time because at least 80 of them are needed for a fair-sized scaffold.

After they have been fabricated, the plates are welded to the legs as illustrated in above figure, taking precautions to align the parts carefully. Welds should be made across the top and down the sides as shown. It is also a good idea to weld the joining edges of these plates.

Four holes are then drilled into the legs for bolts to hold the cross braces. Two are drilled at a point 6 in. from the bottom end of the pipe and above the bottom plates; another two are drilled 6 in. from the top end of the pipe and below the cross beam plates. These holes are to take ¼-in. bolts with wing nuts.

The cross beams themselves are made of 2-in. pipe and each has a piece of 2½-in. angle iron on either


STRAP IRON HOIST RUN — SLIDES ON FRAME-TOP ON PIPE INSERT — BOTTOM ON FRAME — 1 REQ
10'6"
1" STRAP IRON CROSS BRACES 8 REQ EACH LEVEL
SCAFFOLD ASSEMBLY
CASTERS 4 REQ

America's most complete line of arc-welding equipment and electrodes.



**AC WELDERS**
Sizes up to 625 amps. All connectable to 220 or 440 volts—550 volts on request.



**POSITIONERS**
Capacities from 2500 to 36,000 lbs. — remote-control and hand-operated models.



**AC/DC WELDER**
The first machine to give you either AC or DC current at the flip of a switch.



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Four sizes—200, 300, 400, and 500 amps.

**ELECTRODES**
For mild steel, cast iron, "hard-to-weld" steels, stainless steels, hard surfacing.

Welding aircraft de-icing system with P&H AC/DC welder at Douglas Aircraft Co., Santa Monica, Calif.

# New P&H AC/DC Welder does work of two machines for Douglas Aircraft

*... saves time, cuts welding costs, provides new convenience*

The very high temperatures and pressures encountered in jet aircraft de-icing systems posed some new problems for Douglas Aircraft. Instead of aluminum throughout, it was necessary to combine the thinnest gauges of stainless steel and titanium alloy ducts with aluminum sections.

Since AC is required for joining aluminum, and DC for making good welds on titanium and stainless alloys, two separate machines were formerly required at each station. But that was before P&H combination AC/DC machines entered the picture. Here's what a company report says:

"The development of this combination machine has provided better quality, greater convenience, and at the same time lowered our costs for equipment and labor."

Douglas finds that their welders save minutes per part with these machines—they change from AC to DC and back with the turn of a switch. They have less spoilage and less fatigue. And P&H Dial-lectric control provides instant heat selection and an easy, quick-starting arc.

And you can save money with these versatile AC/DC machines, too. See your nearby P&H representative or distributor or write Welding Division, Harnischfeger Corporation, Milwaukee 46, Wisconsin.

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end. The angle irons fit into the plates welded onto the legs.

The angle irons themselves should be welded securely with double fillets and an all-around fillet on each end. The steel studs can be turned out on a lathe. Two such studs are required on each end of a cross beam.

A hole is then drilled through the pipe and angle iron and another one through the iron below the pipe. The longer studs are pushed into the plate, through the pipe, and welded. The shorter studs are welded into the angle iron below where it joins the pipe. Make sure these welds are secure as they will be called upon to take a great deal of weight and strain.

When completed, the cross beams slide into position on the legs and are locked there. The cross braces are then bolted on as indicated. Wing nuts are best for speed of assembly.

Regular casters with long studs are inserted into the legs of the bottom scaffold section.

The ladder is made in sections from 1-in. strap iron. The top ends are bent to fit loosely over the cross beam. Two small brackets are welded just below the bend to hold the next ladder section.

The portable hoist shown is also made of strap iron. The top piece has a 2½-in. bend to fit around the 2¼-in. pipe insert on the top of any level. The bottom piece has a half circle welded to it. This fits against the leg itself. The pivot pulley fits into an eyebolt welded to the end of the hoist. A small brace is welded between the two pieces of the hoist.

The hoist can be snapped into position in just a few seconds and is handy for hauling up buckets or tools.

Since each piece is identical and interchangeable, this scaffold can be readily assembled in just a short time, and there is no need for numbering the parts or sections.

We have found that about five levels are best for height, but more can be added. The five levels rise to a height of about 40 ft.

# Quality control

*from page 39*

erances we need to produce a quality product. For instance: Class A, ± 0.010; Class B, ±1/64; Class C, ± 1/32; Class D, ±1/16; Class E, ± 3/32; and Class F, ±⅛.

At this point we have approved steel, welding wire, fluxes and are now ready for the actual welding of the material into assemblies, subassemblies or component piece parts. But, up to this point, we have not controlled the weldor.

Let's start with the weldor since here we are dealing with the human element:

(1) All new hires, rehires and weldors coming back into the welding department are tested by the training division and classified.

(2) Testing on welding lines is conducted by the inspection analyst, assisted by the line inspector.

(3) The daily quality control check sheet on welders shows (*a*) angle of electrode, (*b*) current setting, (*c*) arc length, (*d*) arc in the root, (*e*) start of the weld, (*f*) end of weld, (*g*) proper size electrode, (*h*) weld correct size, (*i*) probe test, (*j*) magnetic-particle test, (*k*) destructive-sample coupon.

(4) When our quality control charts show a repetition of errors by a weldor, these errors are handled through the man's immediate supervisor, general foreman, superintendent, etc., until corrective action has been accomplished. In some cases, a man's job is duplicated in a test piece, and the man is asked to run this test without changing his machine settings.

### Permanent Record

We feel this test procedure gives a far better check of a weldor's daily quality. It will also call the supervisor's attention to each weldor's ability, and provide a permanent record of individual ability which is available to all supervisors.

Tests are conducted by people thoroughly familiar with the weldor and the job because of daily contact. Also, the weldor has no opportunity to prepare for the test. Increasing the frequency of these tests and altering present test methods contributes greatly toward strengthening our position in the welding field.

Industry's job today is to make products of good quality at prices that people can afford to pay. Quality standards must be maintained at even higher levels, for *today's quality will not sell in the markets of tomorrow.*

**Ohio Machinery Manufacturer uses**

**Arcair® TORCH for WELD PREPARATION**

JEFFREY Manufacturing Company, Columbus, Ohio heavy machinery manufacturer has found the Arcair torch ideal for cutting grooves for welding.

A typical example of this is the steel end disc used in the company's coal and stone crushers. This disc has a "U" groove weld around its circumference, preparation for which was usually made with a gas gouging tip, which resulted in excessive distortion. The welding shop foreman at Jeffrey states that "the use of the Arcair torch has greatly reduced distortion and speeded up the operation." After one pass with the Arcair torch, the ring is ready for welding. No further preparation is necessary! In addition to weld preparation in production fabrication, Jeffrey also uses the Arcair torch for removing defective welds and for general shop maintenance.

Using only an electric arc and compressed air, the Arcair method has solved many such problems for manufacturers everywhere. Write TODAY for your FREE copy of the Arcair Case History Booklet, showing facts and figures of many money-saving applications using the Arcair torch.

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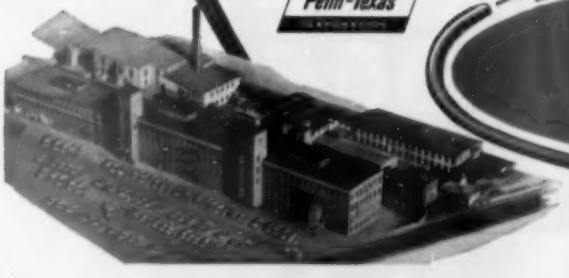
Like all Carol wire and cable, Dynapower Arc Welding Cable is manufactured under strict laboratory control in our complete wire-making plant. Every step, from drawing of wire to compounding of insulation, is centralized under our single responsibility. Write today for complete information to Dept. WE or see your nearby Carol distributor.



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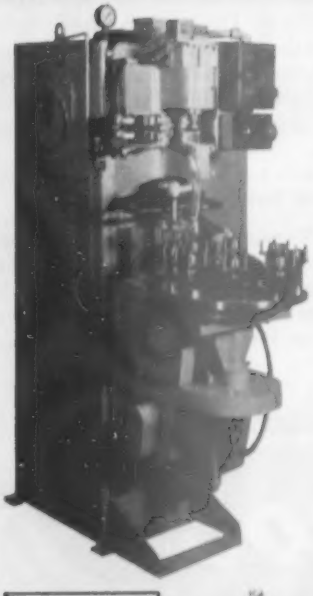
# How Federal Welders help build better motors



To get more efficient assembly of an end head on a fractional horsepower motor, a leading automotive parts manufacturer came to Federal. The result — a standard Federal Bench Type Projection Welder with a special 8 station dial feed operated through a Geneva motion drive that completes 1600 assemblies per hour.

Federal uses a Reeves drive arrangement operating through a gear box to permit flexibility of adjustment of indexing rate. The die slide is spring loaded to insure identical weld force at each station. The manufacturer finds this welder gives a more uniform motor end head, in greater quantities, at reduced costs.

This is another example of how Federal's resistance welding "know how" is paying dividends to one of America's leading industrial concerns. Why not, when next you're considering welding, call *Federal — First in Resistance Welding.*

Federal® WELDERS

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THE FEDERAL MACHINE & WELDER COMPANY

WARREN, OHIO


### For Dutch readers

Dear Sir:

We thank you very much for your kindness in forwarding the photographs we requested as well as for your permission to reproduce the two articles, "Unorthodox methods of casting repair" (WELDING ENGINEER, July, 1954, p. 22) and "32-ft bull gear . . . flame-cut in sections" (August, 1954, p. 42).

This time we are interested in the articles: "Going, going . . . gone" (July, 1954, pp. 36-37) and "Piping and petroleum plus welding and flame-cutting" (August, 1954, pp. 32-35).

We would appreciate it very much if you would be so kind to send us those photographs.

Dr. W. B. H. Jansen
Rotterdam, The Netherlands

*—Permission granted and photos sent.*

* * *

### Wants more information

Dear Sir:

While re-reading the special November (1954) issue of the WELDING ENGINEER, your article on magnetic flux welding apparatus ("Welding mild steel with magnetic flux", pp. 52-53) interested us.

We wonder just how this apparatus would fit in a custom-fabricating plant operation.

Would you kindly inform us how we could obtain detailed information on the magnetic-flux welding apparatus?

W. H. Lawrence
Phillipsburg, N. J.

*—Mr. Lawrence has been referred to American Manganese Steel Div., American Brake Shoe Co., Chicago Heights, Ill., manufacturer of the equipment described in the article.*

* * *

### For Swiss journal

Dear Sir:

In the May issue of WELDING ENGINEER, we found a most interesting article by Thomas J. Dawson entitled, "Cutting and gouging in a shipyard."

We should be deeply obliged to you for letting us have good photos of the 3 figures on pages 45 and 46, as we would like to reprint these pictures in our *Journal de la Soudure.* We would also like to translate this article and print it in the same *Journal.* Due credit to you as the source will, of course, be given.

Dr. C. G. Keel
Swiss Acetylene Association

*—Pictures were sent and permission to reprint was granted.*

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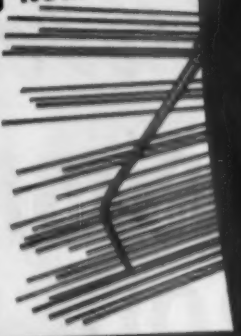

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- Welds 200 inches per minute.
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PROGRESSIVE *Welder Sales Company*

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# 30 YEARS AGO

(Taken from *The Welding Engineer* of August, 1925)

From Paris comes a report of repairing the Pont de Suresnes, a large cast-iron bridge spanning the Seine, by electric welding.

—30 YEARS AGO—

It is reported that the Spokane Oxy-Acetylene Welding Co., 2023 Maxwell Ave., Spokane, Wash., is planning to build a one-story addition.

—30 YEARS AGO—

Keith Dunham Co. of Chicago, Ill., reports the installation of a double-capacity, oxygen-producing unit at Pitcairn, Pa., and also the installation of an oxygen-producing plant for the Burdett Oxygen Co., Chicago, Ill.

—30 YEARS AGO—

Union Carbide Co., New York City, is planning a one-story addition to its plant at Niagara Falls to cost approximately $35,000 with equipment.

—30 YEARS AGO—

J. C. Dawes, formerly with the Weldcraft Co., Pittsburgh, has been appointed a sales representative at the Pittsburgh branch of the International Oxygen Co., Newark, N. J. L. W. McCullough has been appointed sales representative for the branch at Toledo.

—30 YEARS AGO—

The Lincoln Electric Co., Cleveland, reports through Mr. A. F. Davis, assistant to the general manager, that July brought a heavy demand for electric motors and arc welders, both in the United States and abroad.

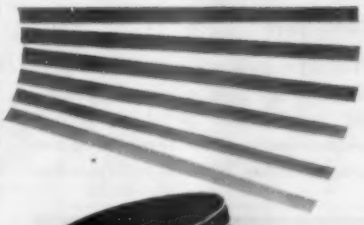
—30 YEARS AGO—

The recent earthquake in Santa Barbara, Calif., caused a great deal of property damage. As soon as news of the disaster reached Los Angeles, Chester Mott, manager of the California Compressed Gas Co. and of the Purox Co.'s sales office at Los Angeles, accompanied by Roy Tadd of the Purox sales force, started for the scene with cutting outfits to assist in the rescue work.

—30 YEARS AGO—

A featured article discusses results of the Gas Products Association held at Mackinac Island, Mich. The meeting stressed the need for better education for welders and more financial aid to welding schools. Also discussed were new uses of the oxyacetylene process and ways of increasing gas and apparatus sales.

**Speed • Efficiency • Economy**



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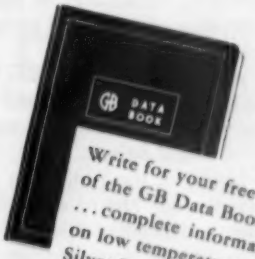
GB 88 Flux, an aid in silver brazing operations, a time-tested product, assures you of maximum protection and high quality joints. Team up a GB Alloy and Flux for dependable results. Other GB Fluxes available for specialized application.

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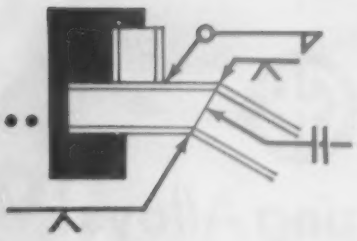


# the welding clinic

**Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.**

## Advantages of the projection welding process

***Question:***

What is projection welding and what are the advantages of this process?

***Answer:***

Projection welding is one of the resistance welding processes. It is similar to spot welding in most respects, except that location of the weld is determined by "projections" placed on the pieces to be joined prior to assembly.

These projections may be embossed on a sheet of metal; turned on a solid piece by machining; or formed along the edge of a piece of metal by a punch press operation.

*The purpose of the projection is to localize welding current flow and concentrate pressure during welding at a predetermined point.*

The height of the projection may be a few thousandths of an inch, 1/8 in. or more, depending upon the job. The American Welding Society has developed recommended design standards for projection welding. They are given in WELDING ENGINEER's Engineering Data Sheet No. 179 on the opposite page.

### Applications

Projection welding is generally used for assembly of parts which are punched, stamped or formed. The projections are thus formed (embossed) during the stamping operation.

Projection welding also is applicable to the use of screw machine parts, the projection being turned on the screw machine part by means of a forming tool. An example of a screw machine part is found in studs or nuts that may be welded to stamped or flat or formed sheet, in order to obtain the assembled piece.

There are so many ways in which projection welding may be used that it is safe to say its applications are limited only by the ingenuity of the designer.

### Limitations

Not all metals are suitable for projection welding. The initial requirement is that the metal be strong enough to support the projection. For example, some brasses collapse too rapidly under welding pressure to make the process practical.

Aluminum is difficult to projection weld. The best results are obtained with extruded parts. Copper cannot be projection welded. In some cases, however, it is possible to weld dissimilar metals, such as steel to brass or steel to bronze.

In making welds of this type, a shorter time period with welding currents higher than those used for steel is required.

Spot welding is preferred for thin steel sheets because of the difficulty in maintaining exact and small projections in thin material. Galvanizing or tin-plating steel does not seem to interfere with projection welding applications.

*—Photo courtesy General Electric Co.*

**FANS for large motors are being projection welded at the rate of 25 units per hour**

### Advantages

There are many advantages to be gained by projection welding. They are:

(1) Longer electrode life.

(2) Better finished appearance.

(3) More uniform results in many applications.

(4) Welds spaced more closely on the parts.

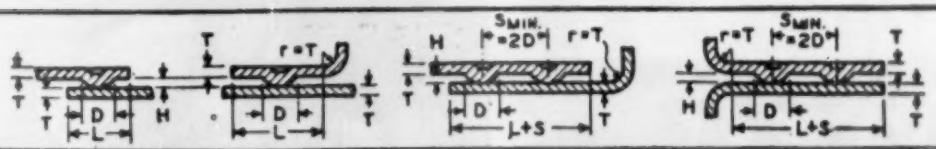
(5) Greater ease of parts welding in an assembly fixture.

(6) Parts may be projection welded that otherwise could not be spot welded.

(7) Welder output may be increased, since it is possible to make many welds at one time.

(8) Better heat balance is obtained for welding difficult combinations of metals and thicknesses.

# Projection welding design data




| THICKNESS "T" OF THINNEST OUTSIDE PIECE (NOMINAL) (SEE NOTES 1, 2, 3 AND 4 BELOW) | DIAMETER OF PROJECTION "D" (SEE NOTES 7, 8 AND 10 BELOW) | HEIGHT OF PROJECTION "H" (SEE NOTES 7, 9 AND 10 BELOW) | MINIMUM SHEAR STRENGTH (SINGLE PROJECTIONS ONLY) LB. | | | DIAMETER OF FUSED ZONE MINIMUM (AT WELD INTERFACE) | MINIMUM CONTACTING OVERLAP "L" (SEE NOTES 5 AND 6 BELOW) | THICKNESS "T" OF THINNEST OUTSIDE PIECE (NOMINAL) (SEE NOTES 1, 2, 3 AND 4 BELOW) |
|---|---|---|---|---|---|---|---|---|
| | | | TENSILE STRENGTH BELOW 70,000 PSI | TENSILE STRENGTH 70,000 UP TO 150,000 PSI | TENSILE STRENGTH 150,000 PSI AND ABOVE | | | |
| INCHES | IN. | IN. | | | | IN. | IN. | INCHES |
| 0.010 | 0.055 | 0.015 | 130 | 180 | 250 | 0.112 | 1/8 | 0.010 |
| 0.012 | 0.055 | 0.015 | 170 | 220 | 330 | 0.112 | 1/8 | 0.012 |
| 0.014 | 0.055 | 0.015 | 200 | 280 | 380 | 0.112 | 1/8 | 0.014 |
| 0.016 | 0.067 | 0.017 | 240 | 330 | 450 | 0.112 | 5/32 | 0.016 |
| 0.021 | 0.067 | 0.017 | 320 | 440 | 600 | 0.140 | 5/32 | 0.021 |
| 0.025 | 0.081 | 0.020 | 450 | 600 | 820 | 0.140 | 3/16 | 0.025 |
| 0.031 | 0.094 | 0.022 | 635 | 850 | 1100 | 0.169 | 7/32 | 0.031 |
| 0.034 | 0.094 | 0.022 | 790 | 1000 | 1300 | 0.169 | 7/32 | 0.034 |
| 0.044 | 0.119 | 0.028 | 920 | 1300 | 2000 | 0.169 | 9/32 | 0.044 |
| 0.050 | 0.119 | 0.028 | 1350 | 1700 | 2400 | 0.225 | 9/32 | 0.050 |
| 0.062 | 0.156 | 0.035 | 1950 | 2250 | 3400 | 0.225 | 3/8 | 0.062 |
| 0.070 | 0.156 | 0.035 | 2300 | 2800 | 4200 | 0.281 | 3/8 | 0.070 |
| 0.078 | 0.187 | 0.041 | 2700 | 3200 | 4800 | 0.281 | 7/16 | 0.078 |
| 0.094 | 0.218 | 0.048 | 3450 | 4000 | 6100 | 0.281 | 1/2 | 0.094 |
| 0.109 | 0.250 | 0.054 | 4150 | 5000 | 7000 | 0.338 | 5/8 | 0.109 |
| 0.125 | 0.281 | 0.060 | 4800 | 5700 | 8000 | 0.338 | 11/16 | 0.125 |
| 0.140 | 0.312 | 0.066 | 6000 | — — | — — | 7/16 | 3/4 | 0.140 |
| 0.156 | 0.343 | 0.072 | 7500 | — — | — — | 1/2 | 13/16 | 0.156 |
| 0.171 | 0.375 | 0.078 | 8500 | — — | — — | 9/16 | 7/8 | 0.171 |
| 0.187 | 0.406 | 0.085 | 10000 | — — | — — | 9/16 | 15/16 | 0.187 |
| 0.203 | 0.437 | 0.091 | 12000 | — — | — — | 5/8 | 1 | 0.203 |
| 0.250 | 0.531 | 0.110 | 15000 | — — | — — | 11/16 | 1 1/4 | 0.250 |

NOTES:

1. TYPES OF STEEL:
   LOW-CARBON - SAE 1010
   STAINLESS - TYPES 309, 310, 316, 317, 321, 347 AND 349
   (MAX. CARBON CONTENT 0.15%)
2. MATERIAL SHOULD BE FREE FROM SCALE, OXIDES, PAINT, GREASE AND OIL
3. SIZE OF PROJECTION NORMALLY DETERMINED BY THICKNESS OF THINNER PIECE, AND PROJECTION SHOULD BE ON THICKER PIECE WHERE POSSIBLE
4. DATA BASED ON THICKNESS OF THINNER SHEET, AND FOR TWO THICKNESSES ONLY
5. CONTACTING OVERLAP DOES NOT INCLUDE ANY RADII FROM FORMING, ETC.
6. WELD SHOULD BE LOCATED IN CENTER OF OVERLAP
7. PROJECTION SHOULD BE MADE ON PIECE OF HIGHER CONDUCTIVITY WHEN DISSIMILAR METALS ARE WELDED
8. FOR DIAMETER OF PROJECTION "D" A TOLERANCE OF ± 0.003 IN. IN MATERIAL UP TO AND INCLUDING 0.050 IN. IN THICKNESS AND ± 0.007 IN. IN MATERIAL OVER 0.050 IN. IN THICKNESS MAY BE ALLOWED
9. FOR HEIGHT OF PROJECTION "H" A TOLERANCE OF ± 0.002 IN. IN MATERIAL UP TO AND INCLUDING 0.050 IN. IN THICKNESS AND ± 0.005 IN IN MATERIAL OVER 0.050 IN. IN THICKNESS MAY BE ALLOWED

*Courtesy American Welding Society*

# on the job . . .

—Wall Colmonoy Corp.

**LIFE of plug-type pipe line valves is being prolonged with a hardfacing application by the manufacturer. Left: hardfaced plugs before grinding. Right: smaller plugs after grinding and chrome coating**

—Linde Air Products Co.

**PRODUCTION time is reduced by Tig (tungsten inert-gas) welding of evaporator units for refrigerators. Seven tack welds on each unit require only 1¼ minutes**

—Natkin and Co.

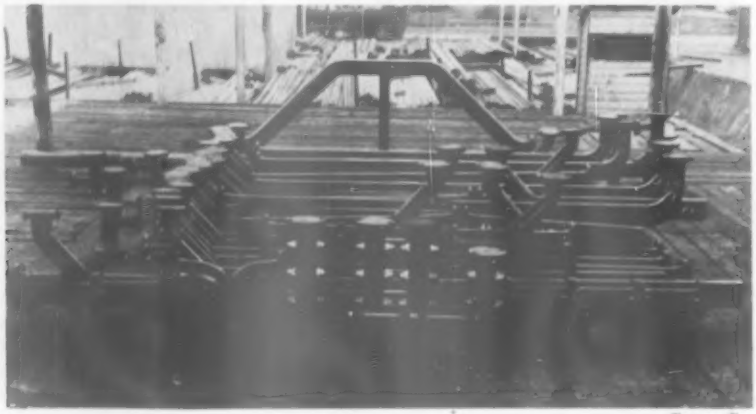
**MANUFACTURER of jet aircraft used welded stainless steel pipe like that above in a pneumatic functional test on jet engine parts. A pressure of 300 lb is exerted on pipe by 1,000 F air**

—Baldwin-Lima-Hamilton Corp.

**ONE-piece forged steel rings, welded to an asphalt plant dryer drum, replace hot-rolled steel bars. Rings serve as rails to rotate drum**

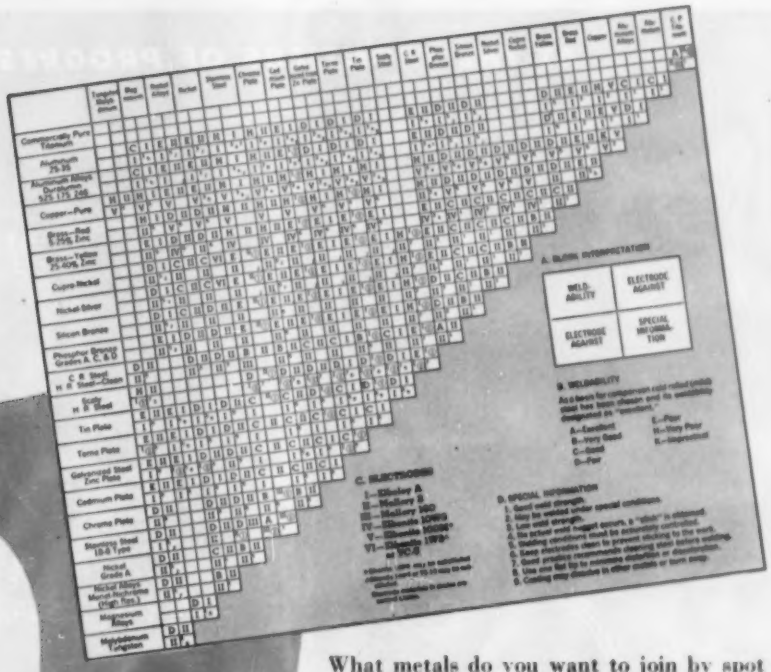
—Linde Air Products Co.

**NEWLY designed aluminum Boy Scout canteen is now Tig welded along circumference seam**



—Crane Co.

**WELDED fabrication of these seamless pipe tees, sweep fittings, headers and lateral connections make for accuracy and easy field assembly**



*For your spot welding jobs*

# Are you using the right electrode alloy

What metals do you want to join by spot welding? For over 200 different metal-to-metal combinations, the chart pictured here can give you a lot of valuable welding data. Based on many years of laboratory study and field experience, it tells you at a glance—

- The recommended Mallory alloys to use as electrodes against each metal.
- The weldability you can expect.
- Special information on welding techniques to be followed.

This "electrode recommendation chart" is just one of the many useful features you will find in the Mallory Welding Catalog. Described in this publication are the unequalled variety of welding alloys which Mallory has developed to meet every welding requirement . . . to provide the best combinations of conductivity, hardness, strength and wear resistance in hundreds of different designs. Mallory electrodes, holders, seam welding wheels, forgings, castings and dies are listed, for your convenience in planning effective and economical welding set-ups.

Get a copy of this catalog from your Local Mallory Welding Distributor. And if you have a welding problem, ask your distributor or write directly to Mallory for recommendations on electrodes, alloys, holders and techniques that can save your production time and money.

*Expect More . . . Get More from*

P. R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

*In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario*

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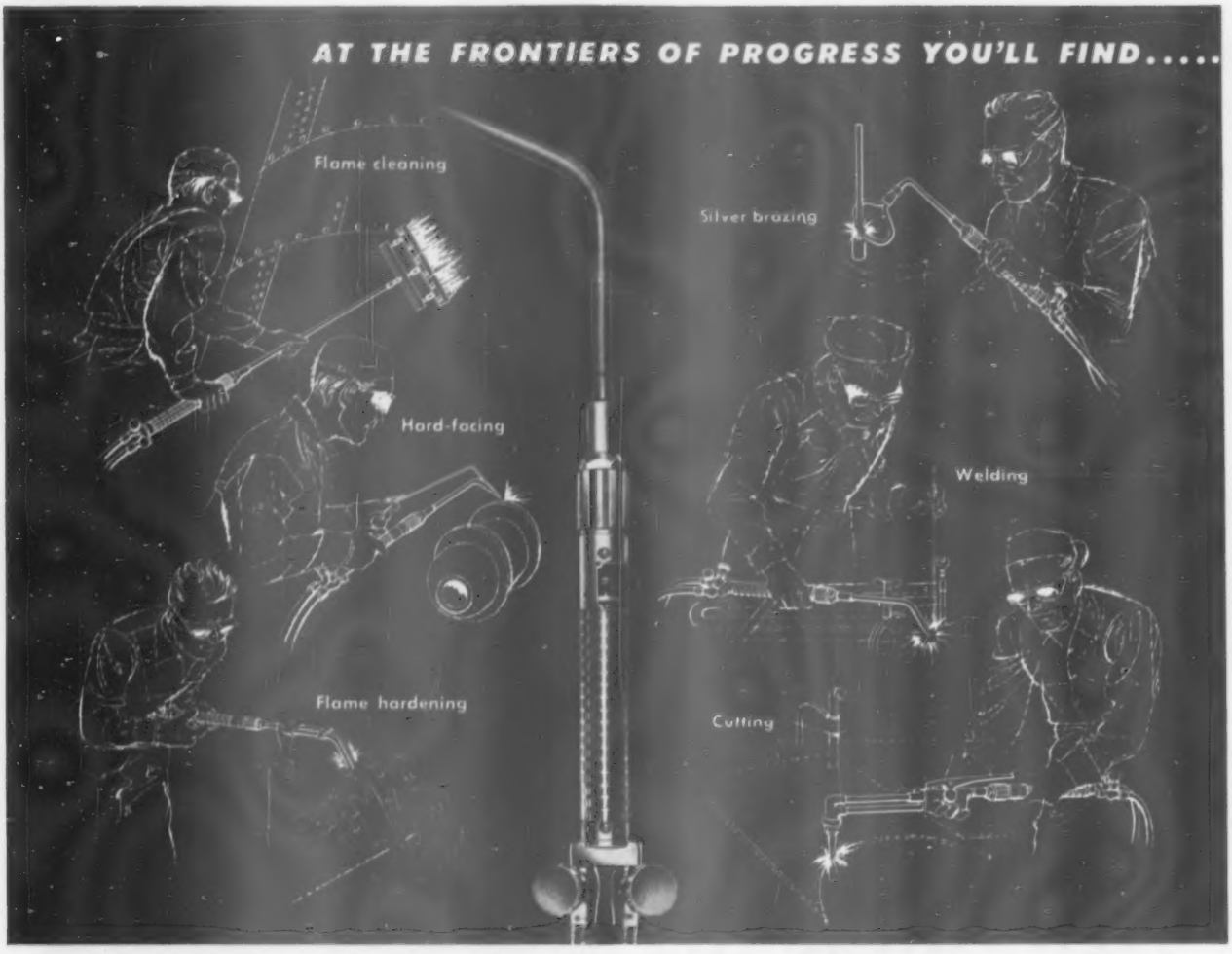
Electrochemical—Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

**For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio**




# AIRCO 800 TORCH DOES THEM ALL

**Airco 800 is the most useful torch you can buy.** With one Airco 800 Torch and a suitable selection of tips you can perform brazing, welding and heating jobs better than with any other single torch. You can:

- **weld cast iron and steel ranging from thin sheet up to the heaviest thicknesses**
- **braze weld steel and cast iron**
- **silver braze both ferrous and nonferrous metals**
- **preheat heavy castings and plate**
- **straighten and bend steel plates**
- **flame descale and dehydrate**
- **hard-face**
- **flame harden**
- **cut steel to 8" in thickness**

Airco's high gas flow capacity and precision-drilled mixer provide the smooth constant supply of well mixed gas and steady flame that makes for top performance on *all* jobs, *regardless of* size.

**Over 30 types of tips** – each instantly interchangeable – from size 0 single flame up to size 15 multiflame are available. You can get either long or bulbous flame. Separable tips may be used with a Universal or Jet mixer. Cutting attachments will enable you to cut up to 8" plate. Catalog #818 tells all about the Airco 800 Torch, the light and medium Airco 700 Torch, and Airco's complete line of welding and cutting torches, tips and accessories. Contact your nearest Airco office or authorized Airco dealer; ask for your free copy.

AIRCO®

**AIR REDUCTION**

**60 East 42nd Street • New York 17, N. Y.**

*Divisions of Air Reduction Company, Incorporated, with offices and dealers in most principal cities*
Air Reduction Sales Company
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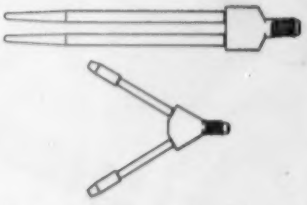
Represented internationally by Airco Company International
Foreign Subsidiaries:
Air Reduction Canada Limited
Cuban Air Products Corporation

**Products of the divisions of Air Reduction Company, Incorporated, include: AIRCO** – industrial gases, welding and cutting equipment, and acetylenic chemicals • **PURECO** – carbon dioxide, liquid-solid ("DRY-ICE") • **OHIO** – medical gases and hospital equipment • **NATIONAL CARBIDE** – pipeline acetylene and calcium carbide • **COLTON** – polyvinyl acetates, alcohols, and other synthetic resins.

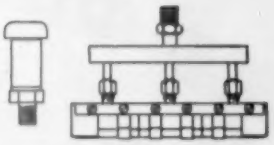
AN AIR REDUCTION PRODUCT

**AIRCO items for welding and cutting**

A wide selection of tip mixer assemblies, and separable tips and mixers are available for the 800 torch.



**Dual tube tips** with flexible tubing permit heat to be applied simultaneously to both sides of tubular assemblies. They are available in either bulbous or multiflame types.



**Flame cleaning** and dehydrating apparatus consists of multiflame tips which are fitted with extensions to standard Airco torches. Use the flat tip – available in widths from 2 to 12 inches – for flat areas. Use round tip for riveted areas, edges, corners, etc.

**Styles 1800 or 2800** cutting attachments convert the Airco 800 to medium or heavy duty cutting torches. Available in either 90° or 75° heads.

***Write AIRCO for literature on these items***


## DOWN MEXICO WAY

# Welding *macanudo!**

LA CONSOLIDADA, S.A., is a steel company in Mexico City. There are no graduate welding engineers in design or production there. In all Mexico, in fact, such men are rare.

But a lack of formal education in welding theory hasn't stumped La Consolidada's shop workers. Applying individual "degrees" of common sense, they recently completed a piece of work that might be rated "as good as the best."

A 3,500-lb pinion shaft, used as a speed reducer on a rolling mill, cracked in service. At the point of fracture, the shaft measured 30.5 centimeters (approximately 12 in.) in diameter and, under the circumstances, little hope was held for complete and reliable repair.

The company, however, reckoned without the native ingenuity of its repair crew. These men went to work immediately to cut an included vee-angle of 90 deg in the shaft.

Six ½-in.-thick gussets were set into the angled cut at 60 deg intervals and welded in place. The workmen were aware of the contraction resulting from weld cooling, and took this step to prevent misalignment.

### 48 Hours of Welding

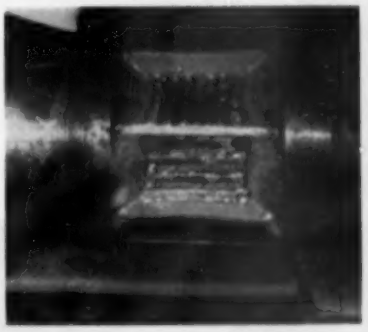
Using 180 lb of ¼-in. E-6012 electrodes, the weldors worked continuously for 48 hours to seal the gusseted cut. Taking further steps to prevent misalignment, the men worked in pairs, welding simultaneously on opposite sides of the shaft. They also criss-crossed their welds (see picture).

Completing their weld, the workers ground down the excess filler metal and sent the shaft back into service. Driven by an 800-hp motor, the pinion shaft normally operates at a speed of 125 rpm.

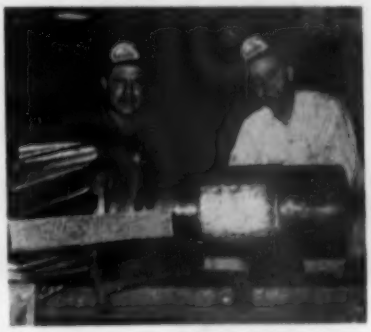
Basing practical applications upon sound theory obviously is the modern and the preferred method of operation. But where circumstances allow only for men who learn the "hard way," you'll find it difficult to beat a crew like that at La Consolidada.

*Literally, a good job of welding.

**GUSSETS at 60 deg intervals prevented contraction and misalignment during weld cooling**



**WELDS were made simultaneously on opposite sides, and in a criss-cross fashion to prevent warping**



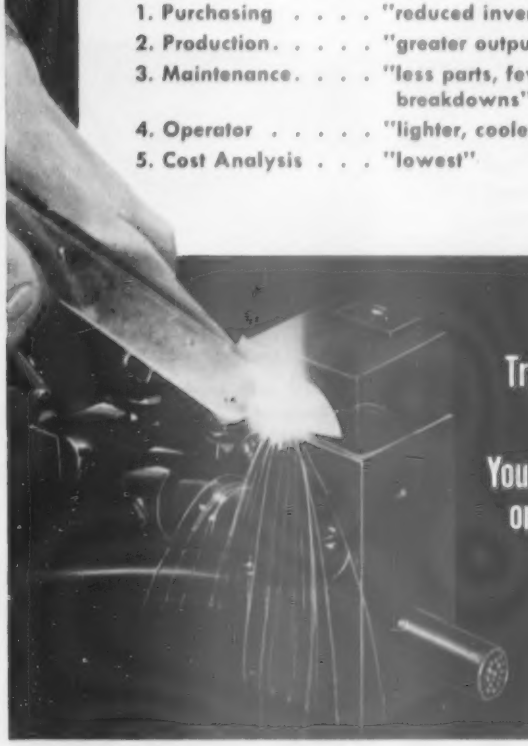
**WELDORS take obvious pride in their work on completed pinion shaft, which needs only grinding to regain its original smooth surface**

# HAS YOUR PLANT TRIED CADDY?

CADDY Arc Welding Accessories are all designed to utilize the finest of all electrical connections—CADWELD. From welding machine to electrode, the CADWELD connection has revolutionized the arc welding circuit. Today after five years of on the job analysis, companies all over the United States are standardizing on CADDY Arc Welding Accessories and CADWELD cable splicing.

The reason for the acceptance of the complete CADDY Arc Welding Circuit is that it proves itself to:

1. **Purchasing . . . . "reduced inventory"**
2. **Production. . . . . "greater output"**
3. **Maintenance. . . . "less parts, fewer breakdowns"**
4. **Operator . . . . . "lighter, cooler"**
5. **Cost Analysis . . . "lowest"**



Try ***CADDY*** TODAY— You'll standardize on ***CADDY*** tomorrow

**CADDY®** Arc Welding Accessory Div.

***Erico Products, Inc.***

2070 E. 61st Place • Cleveland 3, Ohio

IN CANADA: ERICO INCORPORATED, 3571 Dundas St., West, Toronto 9, Ontario

# Question-Mark* FITTINGS ...A BARGAIN?

***They could cost you your reputation!***

***QUESTION-MARK FITTINGS**

Who is manufacturer?
How about his reputation?
What is his experience?
Does he give service?
Does he offer complete line?
Is stock available nearby?
Do fittings meet U. S. standards?
Are dimensions accurate?
Is circularity true?
Equal to strength of pipe?
Are fittings permanently marked with manufacturer's trademark and material designation?

**YOU RUN THESE RISKS WITH THESE UNKNOWN PRODUCTS:**

Failure in service... work stoppage... waste.
Impaired efficiency due to improper design.
Non-uniformity... wastes manhours.
Poor availability... costly in emergencies.
Short-line supply... handicaps selection.
Lack of service or responsibility.
Lack of engineering help on piping problems.
Lack of cost-cutting advancements.

*Presented in the interests of piping safety and economy by*

## TUBE TURNS

A Division of National Cylinder Gas Company
LOUISVILLE 1, KENTUCKY

... Producer of **KNOWN VALUES**

*Remember* the trade-marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS.

# How to safeguard your piping and get *more for your money*

When you buy TUBE-TURN* Welding Fittings and Flanges, you get these known values:

**TOP QUALITY AND SAFETY** **RESPONSIBILITY** **PRECISE UNIFORMITY**
**ENGINEERING SERVICE** **WIDE SELECTION** **LOWEST-COST PERFORMANCE**
**PROMPT DELIVERY** **DESIGN ADVANCEMENTS**

They are made in U.S.A. and are identified by the trade marks shown above.

They meet ALL American Standard and Safety Code requirements.

They are engineered to give maximum strength and performance and in many cases exceed requirements by generous margins.

To get *more for your money* in welding fittings and flanges, specify the leading brand and buy from your trusted Tube Turns' Distributor.



**Tube Turns' nearby complete stock SAVES YOUR PURCHASING TIME**

**Tube Turns' pioneering research GIVES YOU ADVANCED PRODUCTS**

**Tube Turns' engineering help GIVES YOU COST-CUTTING IDEAS**

*The Leading Manufacturer of Welding Fittings and Flanges*

# TUBE TURNS

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Los Angeles • San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas

*"TUBE-TURN" and "tt" Reg. U.S. Pat. Off.

# Welded steel door withstands beating

**TRAMWAY loader door of welded design holds up under continuous heavy beating**

THIS is a story about nothing more than a door—a simple, swinging steel door for the loading hopper of a continuous, aerial, wire-rope tramway system installed at a Kentucky coal mine.

Its basic design is over 30 years old and has progressed from a riveted assembly of plates, shapes and blacksmithed parts, through various combinations of riveted and welded components, to the present rugged concept which is a complete weldment.

As the tramway cars pass under the loader, a tripping mechanism unlatches the door to allow a 40-cu-ft, 1½-ton load to drop into the car. This must be accomplished in half a second as the car is moving at a speed of 500 feet per minute.

Obviously, there is not time for the door to swing out of the way, so it is provided with two horns on the lower edge which the front of the car strikes as it passes. The horns ride the top of the car until it clears, whereupon the door swings shut and latches to the hopper.

### 140 Times an Hour

The door goes through its cycle about 140 times an hour, and, on occasions, the tramway system will be operating 20 to 22 hours a day for six days a week.

All of this means a terrific amount of abuse on the door and its hinging system in terms of static, impact and wracking loads. Yet its uninterrupted functioning is vital to the operation of the tramway, which may represent an investment of from $500,000 to $1,000,000.

The accompanying illustration shows the door as now redesigned. All parts are of steel, and the assembly is fully welded and stress relieved. Even the former hinge and horn castings are now welded steel sections, flame-cut to shape.

Alignment of the hinges was accomplished by fitting them to a shaft of the proper size, then lining them up on the door and welding. The shaft was withdrawn, with no warping or binding encountered.

### Lighter in Weight

The latest door design weighs 467 lb, against a previous 526 lb. In addition to the appreciable saving in weight of material, a considerable reduction in labor and overhead costs was realized from the all-welded design, which was originated by the Interstate Equipment Division of the Yara Engineering Corp., Elizabeth, N. J.

Edward J. Hughes, Interstate manager, furnished the details to The James F. Lincoln Arc Welding Foundation, Cleveland.

The unit is in service at a mine of the Inland Steel Co. near Price, Ky.

"YOU WOULD HAVE TO GIVE HIM A JUNIOR WELDING OUTFIT!"


**sellstrom safeguards** *designed for comfort*

**ONE-PIECE EYE SHIELD — 4 Sizes — WINS QUICK APPROVAL EVERYWHERE**

Here is one of the most popular eye shields to be found anywhere in the U. S. It has the approval of safety engineers, industrial workers and management. Just consider these facts:

1. One-piece construction from .060 clear "Plexiglas" (patented), 92½% clarity by laboratory test. This is higher clarity than clear glass.
2. Offers wide vision. The entire shield is a single lens. Has patented rolled edges for perfect fit on face and for "all day" wearing comfort.
3. There are four fine mesh screen ventilators to keep out the dust but permit liberal ventilation.
4. Offered in four sizes: 39-A, 4¼" lens; 39-B, 5" lens; 39-C, 5¼" lens; 39-D, 6" lens. The 5¼" lens should accommodate all present-day shell rim prescription glasses but the 6" size appeals to those who desire extra roominess.

When ordering in standard dozen lots, we recommend two of 39-A, four of 39-B, four of 39-C and two of 39-D. This assortment seems most satisfactory and is based on actual requirements in industrial plants.

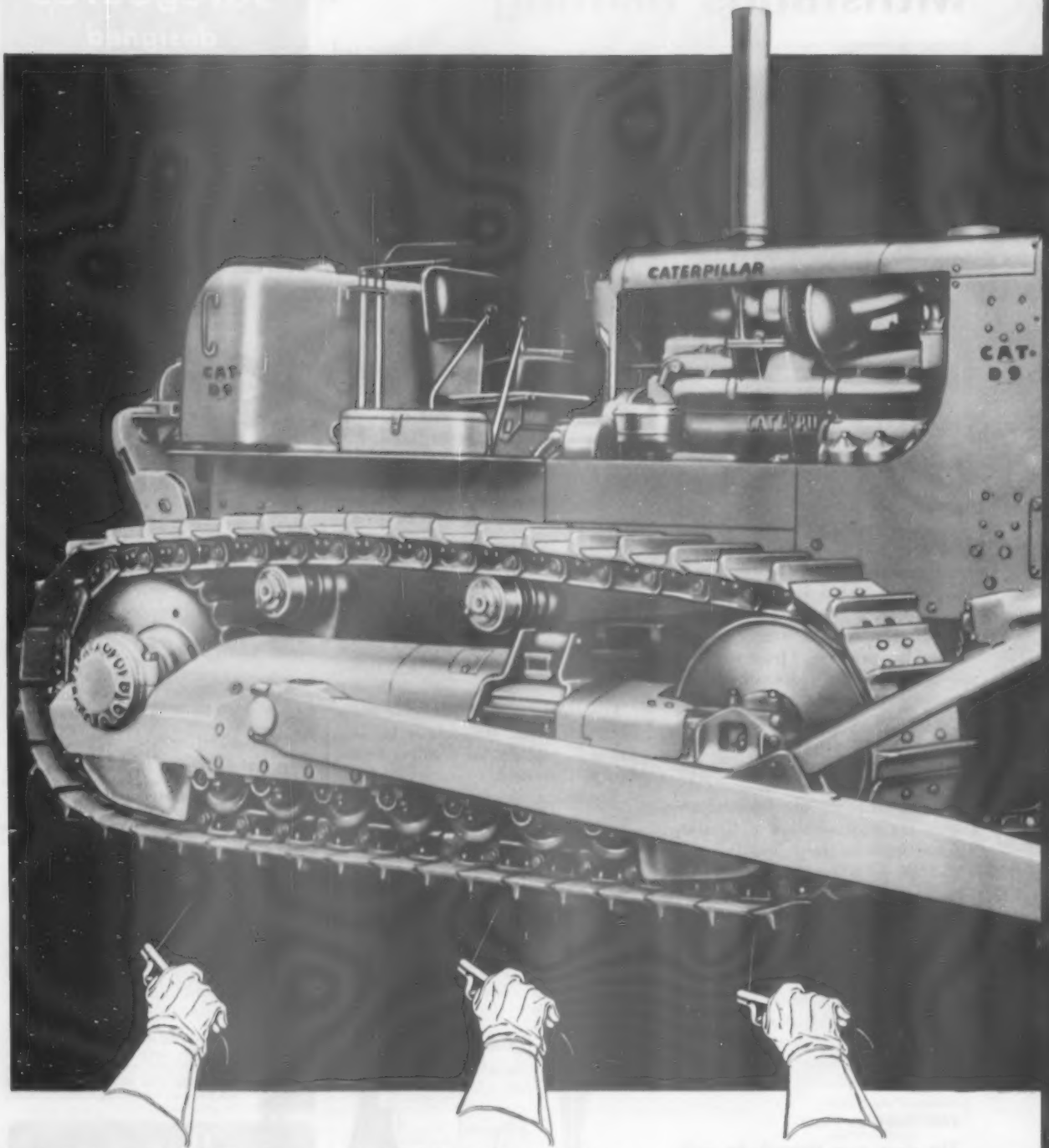
This shield is available at all better class dealers. Write us direct for additional information, not only regarding this shield but any and all eye and face safeguards required in your plant.

**sellstrom MANUFACTURING COMPANY**

*Eye and Face Safeguards Designed for Utmost Comfort*

226 Hicks Road Palatine, Illinois

# A. O. Smith welding




**To give frame and gear box bonus strength—guts to withstand extreme punishment—Caterpillar welds with A. O. Smith's SW-35 electrodes. SW-35 (E-6020) electrodes produce 45° fillets without undercut, are ideal for downhand welding, too.**

**A. O. Smith SW-17 electrodes are used to complete the mighty D9's frame. These AWS Class E-6012 electrodes lend themselves to heavy production welding . . . possess greater built-in toughness than other electrodes in their class.**

**Critical parts of the D9's steering clutch case are welded with A. O. Smith SW-15 electrodes. High heat and high speed combine with stand-out performance in all positions to make these the finest universal electrodes in AWS Class E-6013.**

# electrodes help build world's biggest crawler tractor

## CATERPILLAR D9 TRACTOR

**Built for brutal service . . . this the mightiest of all crawler tractors delivers 230 turbo-charged horsepower at the drawbar.**

Reliable performance on the world's toughest projects results from Caterpillar's engineering and manufacturing skill . . . unfailing insistence on quality. The company is famous for using only the finest materials and components. For years, they have been among the largest users of A. O. Smith electrodes.

NOTE! *A. O. Smith supplies three kinds of welding electrodes for use in the manufacture of the world's biggest crawler tractor — the D9. These electrodes are favorites with the welding operators who work on the D9 line. Of course, all three electrodes were selected after thorough testing . . . after they had proved their ability to produce Caterpillar-quality welds all the time.*

If welding quality is on your mind, too, it will pay you to investigate A. O. Smith electrodes. See the representative who calls on you . . . or write A. O. Smith Corporation, Welding Products Division, Milwaukee 1, Wis.

**PRODUCED BY WELDERS FOR WELDERS**

**Because welding is our full-time business, we offer you America's top line of welder-proved electrodes, machines and accessories.**

***The man from A. O. Smith . . .***

**Erv Steidl is the representative who helped Caterpillar select the right A. O. Smith electrodes for use on the D9. Not just a salesman — but a trained welding consultant — the man from A. O. Smith will be glad to help you with your welding problems.**

*Through research . . . a better way*

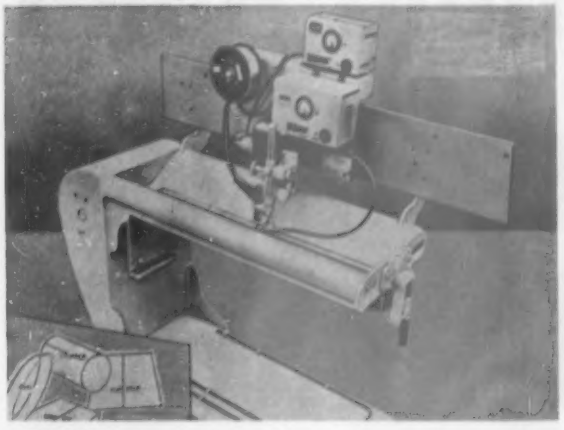
**A.O.Smith**

CORPORATION

WELDING PRODUCTS DIVISION
Milwaukee 1, Wisconsin

INTERNATIONAL DIVISION: MILWAUKEE 1, WIS.

# new products . . . . . USE CARD ON PAGE 85



**WELDING** fixture can weld a variety of shapes from 0.005 to 1 in. thicknesses

**COMPACT** generator-type welder is gasoline-engine driven. D-c model handles all types of d-c welding

## Welding fixture

LONGITUDINAL welding fixture, "Model LW, series 1000," is designed for welding a variety of shapes by any of the fusion-welding automatic processes or hand welding.

Features claimed: good operator visibility; narrow hold-down fingers which pivot and are adjustable in and out; inclusion of up to six copper or metal inserts in rotating back-up mandrel, with a choice of grooves.

Fixture is available in lengths from 2 to 12 ft. *Airline Welding & Engineering.*

**Circle No. 1.**

* * *

## Timer

"ARC-Time Totalizer" is said to accurately register the time an arc current is in use. The timer is simply designed with no-moving-parts, manufacturer claims. Current leakage, or any current below a specified amount, will not register on the clock.

The timer operates when an a-c or d-c current passes through a coiled welding cable. This sets up a magnetic field which will trigger a vacuum diode when a specified current is passing through the coil. This triggering activates a companion a-c circuit with a sensitive relay which starts a clock. Current falling below a specified amount, stops the clock. *Exline Engineering Co.*

**Circle No. 2.**

* * *

## Rectifier

HIGH-voltage, mercury-vapor rectifier tube is designed for high and medium voltages. Known as "Type 6693," the tube is said to deliver higher currents necessary for high-current industrial and communications power tubes.

It delivers 9 amp up to 12 kv in full-wave, three-phase power supply. Three tubes will give 6 kv at 9 amp, using one filament transformer in three-phase, half-wave power supply. *Amperex Electronic Corp.*

**Circle No. 3.**

* * *

## Welding positioner

THE "WP-1" welding positioner is designed for use as a bench model. It is claimed to aid in faster production of smaller fabrications.

With its 24-in. table horizontal, the unit is 15⅞ in.-high. It weighs 100 lb and can handle weldments up to 500 lb, it is said. A pedestal for floor mounting is available. Turntable can be rotated manually or electrically. Positioner has electronically-controlled a-c motor drive for the rotating table running from 0.18 to 4.47 rpm in infinite stages.

Table can tilt 135 deg from horizontal without weldment striking positioner. A manual tilting crank has a positive, spring-lock indexing for holding a pre-selected position. *Harnischfeger Corp.*

**Circle No. 4.**

* * *

## Midget thermostat

LINE of midget thermostats, ¼-in. in diameter and less than 2½-in. long, is designed for precise temperature control or heat detection applications, wherever installation space is at a premium. Each weighs about 1 oz. *Fenwal, Inc.*

**Circle No. 5.**

## Welder

THIS line comprises generator-type welders that are gasoline-engine driven. Units are compact, self-powered and may be equipped with optional running gear. They are available in current ranges of 30 to 350 amp, a-c or d-c.

One d-c model is claimed capable of handling all types of d-c welding. It can also be converted into an a-c power plant by a conversion switch. The a-c model has a 110-volt, d-c outlet for operating universal drills and lights. Another model has high frequency suitable for use in inert-gas welding. All models have infinite current adjustment steps.

The gasoline engine is an air-cooled, four-cylinder, 20-hp type. It has electric starting and variable-speed control attachment. *Westinghouse Electric Corp.*

**Circle No. 6.**

* * *

## Welding head

THIS "Model J" welding head is a compact precision-welding unit for small parts and sub-assemblies. Suitable for use in most types of resistance-welding controls, it is said to produce strong clean welds at high speeds with a minimum of operator fatigue.

Both upper and lower electrodes are held by horizontal supports which project outward, giving maximum visibility and work-handling freedom. Lower support may be rotated about a vertical axis for accurate positioning. Lower electrode may be mounted vertically or horizontally. *Raytheon Mfg. Co.*

**Circle No. 7.**

# STOODY 21 EXTENDS SERVICE LIFE OF DREDGE PARTS FROM TWO MONTHS TO FULL YEAR

Dredges operated by the W. T. Burton Company, Inc., at Carlys, Louisiana, are used to recover shells from shallow under-water beds; this is the material from which the famous Louisiana shell roads are made. Thousands of tons of highly abrasive sand and silt are handled in the process.

Normally the cutter heads and impellers in such operations last about 60 days; hard-faced with Stoody 21, service life has been increased to a full year. As the hard metal is gradually worn away, the parts are again hard-faced and go back into service. Huge savings result in increased parts life and reduced down-time.

Most heavy equipment subjected to severe abrasive wear and impact can be given similar extended service life with Stoody 21. This material is a high alloy electrode, applied either AC or DC, and its rapid burn-off rate makes it ideal for protecting large surfaces.

Detailed application and procedure information is covered in the Stoody Guidebook that you can get from your Stoody Dealer (consult the Yellow Pages of your telephone book). Your dealer has a free copy waiting for you ...or write to the company.

*Entire inner surfaces of cutter head are hard-faced ... approximately 250 pounds of Stoody 21 were required for the cutter head and impeller pictured here. Amount of material will depend on extent of wear. Outer surfaces of cutter blades are hard-faced along cutting edges only.*

*The entire impeller hub and the leading pressure faces of the vanes are hard-faced with Stoody 21; hard-facing is repeated until side discs are worn out, and hub is then welded into a new unit.*

**STOODY COMPANY**
11941 East Slauson Avenue
Whittier, California

*Quality is a big part of skill*

Famous "Sam Snead" woods and irons. Partners in winning cups.

**Look for better workmanship where quality tools are used**

Model H Cone and Chisel one of 27 models

## ATLAS TOMAHAWKS

No question about it — good tools produce better results. The name Atlas is standard in shops where weld cleaning is taken seriously. Workers like the balance and "feel" of Atlas Tomahawks and take pride in the better work they produce. You'll like the way they wear, too.

Ask your welding supply dealer to show you the Atlas line

**ATLAS**
WELDING ACCESSORIES COMPANY
701 E. LEWISTON AVENUE
FERNDALE 20 DETROIT 3, MICHIGAN

ASK YOUR WELDING SUPPLY DEALER

**A good weld cleaning job performed with good professional tools will better reveal the quality of the weld**

**You Can't Beat ATLAS Quality**

### D-c welder

"CONTROLARC", a magnetic-amplifier, rectifier d-c welder, is claimed to give constant, automatic-arc control. Available in 200, 300 and 400 amp, the welder adjusts the arc to changes in conditions from arc strike to end of pass. A magnetic amplifier analyzes voltage and adjusts current to arc changes.

Any volt-amp combination within the output range is possible due to voltage-current control.

Welder has downdraft cooling, separate duct-cooled reactor and transformer units, and sealed-in lubrication of fan motor bearings. *Vickers Electric Div.*

**Circle No. 8.**

* * *

### Welding filter

THIS electronic device is said to eliminate smoke and dust from welding operations. No venting to outside air is needed.

The electrostatic filter, fan and controls are housed in a sturdy, portable metal cabinet, which also serves as a welding bench. Air flow carries smoke and fumes into the filter. Welding visibility is improved and operator fatigue reduced by its use, manufacturer says.

A grating in the cabinet top gives a 24 by 24-in. welding area. The bulk of the spatter drops through to a spatter trap below.

Unit is 47 by 24½ by 36-in. high, and weighs 460 lb. *Papec Machine Co.*

**Circle No. 9.**

**For more information use card on page 85**

Automatic welding at Solar Aircraft

# CRUCIBLE stainless steel welding wire

## *for faster, cleaner, uniform weld quality*

Save time and money . . . get better weldments with Crucible stainless steel welding wire. For Crucible welding wire is made by *steelmen* for optimum performance on the job.

You can get these superior welding wires for any type of automatic welding . . . in most stainless grades and sizes . . . and in spools, coils and cut lengths.

They're all quickly available through your nearby Crucible warehouse. Next time you need stainless welding wire call Crucible. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.*

**CRUCIBLE** first name in special purpose steels

## Crucible Steel Company of America

# United's PHOSONS & SILBONDS

## Produced Under One Control

...In Wire, Rod, Strip, Powder and Finished Preforms for your Brazing Alloy Requirements

## Why are PHOSON and SILBOND "Natural" Brazing Alloy Choices?

Because, despite their remarkably low brazing temperatures, Phoson and Sil-Bond are able to make high strength, ductile, leak-proof joints. And they flow so quickly and freely, brazing time is at a minimum.

Because, Phoson and Sil-Bond are produced in one *United Wire* mill from component elements through all production steps including alloying, casting, rolling, wire drawing, coiling straightening *and* even, when required, into preformed shapes to *your* specifications!

*Ask for the new Phoson Folder*

One central, *responsible* control is your assurance of products to consistent high quality and of prompt delivery promises *maintained.*

For Dependable Low Temperature Brazing You Use The Finest Alloys When You Use PHOSON and SILBOND

*Wherever you join metals make them*

**UNITED WIRE & SUPPLY CORPORATION**
PROVIDENCE 7, RHODE ISLAND

Permanently United

Offices in Principal Cities
SEE YOUR UNITED WELDING SUPPLY DISTRIBUTOR

### Electrode holder

NEW feature of improved "Duro-lite" electrode holder is its short release lever. Lever does not project beyond the operator's first finger when gripping the holder in a normal position. Re-designed spring permits the lever in a working position to assume a position closely parallel to the handle. *Duro Engineering Co.*

**Circle No. 10.**

* * *

### Pressure gages

"ECONOMIZER" gage is for use with oxygen, acetylene, air and $CO_2$. The body and bonnet are forged, solid brass. For easy and quick reading, the 2 in. gage has a large, clear, well-marked dial. It weighs about 2 lb, but is sturdily built for rough usage. *Dockson Corp.*

**Circle No. 11.**

* * *

### Safety spectacles

SAFETY spectacles have interchangeable lenses which are snapped into the frames. For eye protection from impact, clear lenses are provided. Light-green lenses are available for average glare; medium-green lenses are for extreme glare. Gold lenses can be had for increased visual acuity.

Lenses are curved and oversize for extra protection. Frame is curved to fit the forehead. Adjustable temples permit correct fit. *Watchemoket Optical Co., Inc.*

**Circle No. 12.**

* * *

### Welding rod

"MARCO" aluminum, gas welding rod is used for welding aluminum, aluminum manganese alloys, and metal of high purity when maximum resistance to corrosion and high ductility is important. The "2-s (1100)" is available in 36-in. lengths in 1/16, 3/32, 1/8, 5/32, 3/16, 1/4-in. diameters. Typical tensile strength is 13,000 psi. *Morgan Aluminum Welding Rod Co.*

**Circle No. 13.**

**"Two-ply" Monel cylinder** is lowered into heavily reinforced "dynamite die." It will be partly filled with water, and a dynamite stick suspended at water level.

# Monel cylinder Dynamited into fan hub

**The "dynamite die" blows its top,** while Monel cylinder is neatly forced into the contours of the die in a single operation.

## *Proves soundness of welds with* "130" Monel Electrodes

**Fast method of fabricating** this Monel fan hub proves strength and soundness of welds with "130" Monel Electrodes. As you can see, dynamite shaping causes no cracks in tough, ductile Monel®, *nor in the "130" Monel welds.*

**"Dynamite die molding"** solved a problem for the Moore Company of Marceline, Missouri. They wanted to cut production costs on their line of ventilating and cooling tower fans, and at the same time take full advantage of Monel's strength and corrosion resistance. This shaping method costs them *only 15 per cent as much as spinning: does a much faster and better job.*

**Ease of welding with "130" electrodes** plays a part, too, in speeding fabrication of these Monel fan hubs. And "130" Monel Electrodes not only give strong sound welds, but also *welds that are as corrosion-resisting as the base metal.*

**When you weld Monel** be sure to use Inco's "130" Monel Electrodes for best results. And for an up-to-date source of welding information, write today for the newly revised edition of our *Welding Bulletin, T-2.*

**THE INTERNATIONAL NICKEL COMPANY, INC.**
67 Wall Street New York 5, N. Y.

INCO TRADE MARK **WELDING PRODUCTS**
Electrodes • Wires • Fluxes

for SOUND WELDS
•
with OUTSTANDING PHYSICALS
use NEW Bronze-Arc C
PHOSPHOR BRONZE ELECTRODES

Another "first of its kind" development of Alloy Rods Company research brings an entirely new phosphor bronze electrode—Bronze-Arc C. Incorporating a unique low hydrogen type coating, Bronze-Arc C electrodes have demonstrated advantages . . . porosity-free deposits, all-position welding, smooth easy flowing arc characteristics, easy slag removal and outstanding physical properties.

**Typical Physical Properties of Bronze-Arc C Electrodes**

| | |
|---|---|
| Tensile Strength p.s.i. | 58,000 to 65,000 |
| Yield Strength p.s.i. | 30,000 to 37,000 |
| % Elongation in 2" ga. | 42% to 48% |
| Hardness, Rockwell B | 72 to 78 |
| Face Bend | 180° |
| Root Bend | 180° |

Bronze-Arc C conforms to A.W.S.—A.S.T.M. Specification No. B-225-53T, Classification E CuSn-C.

Write today for complete information on new Bronze-Arc C electrodes—the electrodes designed especially for high strength, X-Ray quality welds.

Alloy Rods Co.

General Offices and Plant • York 2, Pa.
Pacific Coast Sales Office and Plant
El Segundo, Calif.

no finer electrodes made . . . anywhere

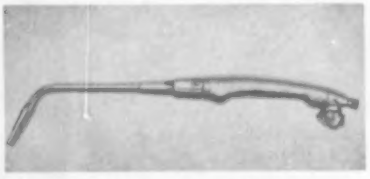
## Regulators

OXYGEN and acetylene regulators are said to give stable delivery of gas pressure despite pressure changes in the gas cylinder. Including all the features of standard two-stage regulators, the "R-90" has been reduced in size. It is claimed to weigh 2/3 less than a two-stage and 1/3 less than a conventional single-stage regulator.

The pressure-reducing unit is a small self-contained capsule, easily changed without taking the regulator off the line. Constant outlet pressure with varying inlet pressure eliminates regulator readjustments, manufacturer claims. *The Liquid Carbonic Corp.*

**Circle No. 14.**

* * *



## Oxyacetylene torch

MEDIUM-pressure, oxyacetylene blowpipe "W-45" is said to offer a wide welding and heating range.

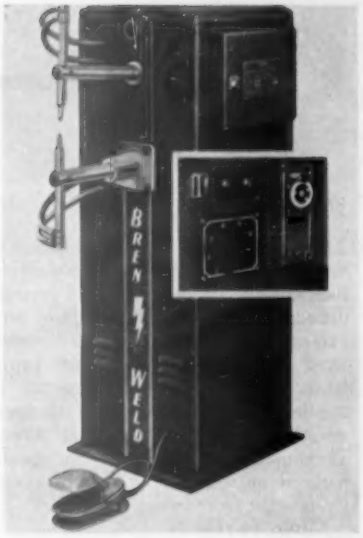
Stainless steel, used for strength and durability, helps to retard heat conduction. Offset hose connections help in curbing pull of hose at rear of the blowpipe. A new type of locking device secures welding heads firmly in place.

Welding heads range in size from 2 to 300-cfh capacity. Welding head extensions are available in 12, 15, 18, and 21-in. lengths. There are 10, 12, 20, and 24-in. head extensions for flame-priming and descaling.

Eight multiflame heating heads, with capacities from 70 to 300 cfh, can be had for use with oxyacetylene, oxypropane, and oxymethane (natural gas). *Linde Air Products Co.*

**Circle No. 15.**

**For more information use card on page 85**




## Spot welder

AN air-operated, fully automatic, 10-kva spot welder, the "Bren Weld SP-100" is said to be the first unit of its type to feature a toroidal transformer. It welds up to 2 pieces of ⅛-in. steel.

This unit has repeat, non-beat operation; a welded structural steel frame enclosed in a heavy-gage steel case; a heavy-duty, double-acting air-cylinder with adjustable speed control in both directions; welding horns which can be moved in and out, and rotated 360 deg.

Controls are mounted on a single side panel. A self-compensating pressure switch is said to eliminate the need for adjustments when air pressure is changed. *Kasson Die & Motor Corp.*

**Circle No. 16.**

* * *

## Welding test plate

NEW test plate, "Test-Well", is said to eliminate cutting and machining samples from sheet stock. The plate is claimed to give perfect tests at a fraction of the cost of cutting, grooving, etc. Two plates may be welded together for another type of weld, further reducing welding test costs, states the manufacturer.

Tests for penetration, color match, and weld inclusions are made by putting a fillet in the vee or by breaking the casting and welding the halves.

The test plate is 2 in. wide by 4 in. long, with a deep vee running through the center. Use of this test plate will eliminate errors, it is claimed, because correct procedure can be determined before welding. *Weld Rod Div. of Chicago Hardware Foundry Co.*

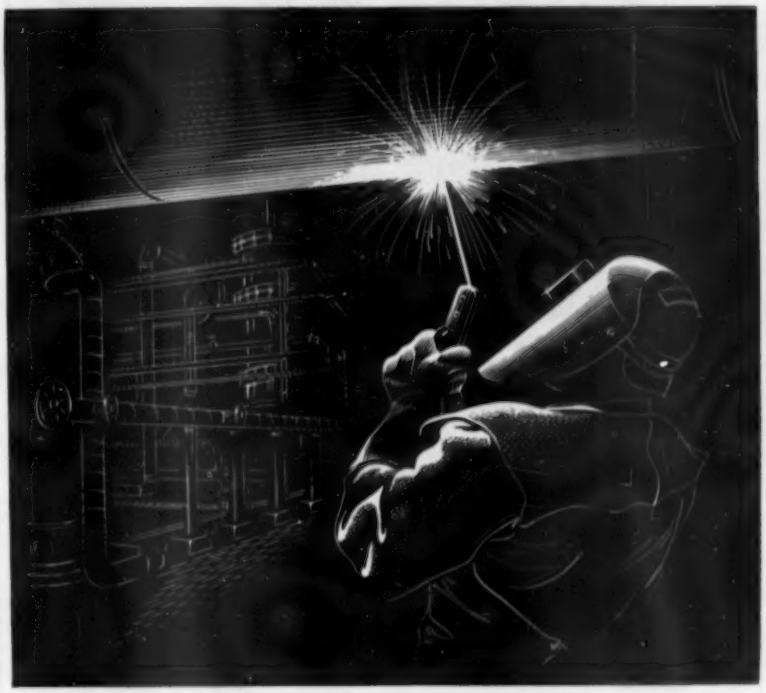
**Circle No. 17.**


**New ARCALOY**

**502 LIME ELECTRODES**

**for x-ray quality welds**

***in 4 to 6% Chrome Steels***



*New* Arcaloy 502 lime electrodes produce welds of required x-ray quality in 4 to 6% chrome steels as required for high temperature, high pressure services. Arcaloy 502 electrodes have a new lime, low hydrogen type coating, *a coating that will not fingernail*, eliminates underbead cracking and provides a basic slag with a scavenging action that consumes impurities.

The New Arcaloy 502 lime electrodes have excellent weldability *in all positions*, with an arc action smooth and stable, an easy-to-control, weld metal and slag. Arcaloy 502 electrodes conform to A.W.S. 85.4 and A.S.T.M. A298-55T Specifications, Grade E502-15. Try the New Arcaloy 502 electrodes for x-ray quality welds in your high temperature, high pressure applications. Contact your Alloy Rods Distributor or write the plant for all the facts.

Alloy Rods Co.

General Offices and Plant • York 2, Penna.
Pacific Coast Sales Offices and Plant
El Segundo, California

*no finer electrodes made... anywhere*

welders and fitters
Lee's RAPAROUND
Handy TOOL FOR PIPE FITTERS & WELDERS
TOUGH
★ 45° ANGLE CHART ★ PROTRACTOR
★ SCALE
FLEX-IBLE
approx. 4" x 60" "Little Helper" complete with spring steel holder. $2.75
★ CONSTANTS TABLE ★ DECIMAL EQUIVALENTS
LEE'S COMBINATION PATTERN SETS
A SET FOR FABRICATING PIPE FROM 2" TO AND INCLUDING 12".
★ FREE CHART for making eccentrics 6" to 8 incl. 24" & concentrics 6" to 12"
Pattern set $3.
ALSO AVAILABLE A PLAIN RAPAROUND 4"x 60"
AND THE "BIG INCH" PLAIN RAPAROUND APPROX. 6"x 60"
OBTAINABLE FROM YOUR DEALER OR POST PAID FROM R. E. LEE
369 JUNIPERO AVE. - LONG BEACH 14, CAL.

*Looking for Welding Sales Leads?*

*Only in WELDING ENGINEER do you have buying-power sales leads. Of all such leads handled by our reader's service department, 74% have come from persons with the title of "foreman" or better—this proves buying power!*

Those who are looking for sales leads in the welding market will be carrying their sales message in WELDING ENGINEER . . . particularly in these important issues

**Closing dates for the:**

**Metal Show Issue, Sept. 5**

**40th Anniversary Issue, Dec. 5**

**Coming . . .**

these special issues of

**WELDING ENGINEER**

October, 1955—Annual Metal Show

January, 1956—40th Anniversary

March, 1956—Annual Distributor Issue

May, 1956—Annual Welding Show

Mid-June, 1956—Annual 14th Fact File Issue

Contact our salesman in your territory or

**WELDING ENGINEER**
12 E. Grand Ave., Chicago 11, Ill.

## Pyrometer

THE "Pyro" surface pyrometer is designed for surface and sub-surface temperature measurements. Fourteen different types of thermocouples and extension arms can be had to meet most temperature-measuring problems. A quick-change connector is available for locking the thermocouples onto the extension arms. Thermocouples are interchangeable without adjustment or recalibration. *Pyrometer Instrument Co., Inc.*

**Circle No. 18.**

* * *

## Hardfacing alloy

"COLMONOY No. 2" is a low-hydrogen hardfacing alloy for heavy-duty uses where impact and wear resistance is required. The iron-base, chrome-molybdenum-silicon alloy is available for general-purpose hardfacing, to manganese and other steels, in the form of a-c/d-c electrodes.

The alloy gives high abrasion and impact resistance and has excellent weldability, it is claimed. Spatter loss is low; fluidity is good. However, it is not recommended for applications requiring heavy build-up, where crack-free deposits are demanded.

The alloy is available in 1/8, 5/32, 3/16, and 1/4-in. diameters, packed in 10-lb metal containers. *Wall Colmonoy Corp.*

**Circle No. 19.**

* * *

## Cylinder rotators

SELF-aligning rotators, "Type CR40", are designed to rotate a maximum load of 2 tons, and can accommodate cylinders between 4½ in. and 6 ft.

Each set consists of one power-driven section and one idler section. Additional idler sections may be used, increasing load capacity accordingly.

Pivot-action of the roller brackets makes unloading easy. Diameters between 4½ and 17 in. can be handled by locking the two brackets on either side in a horizontal position. *F. Bode & Son Ltd.*

**Circle No. 20.**

## Weldor's case

"DUAL-CASE" is divided into two separate compartments for welding rods and chipping tool. Case fastens on belt and is designed to allow easy removal of tools. It is made of riveted, full-grain cowhide with heavy belt loop and solid wood bottom. *Atlas Welding Accessories Co.*

**Circle No. 21.**

* * *

## Bender dies

SIX dies are for the "Universal iron bender," used in maintenance and production work. The "Bender" can bend rounds, pipe, flats, tubing, squares, conduit and angle iron. A hydraulic attachment is available for hard-to-pull bends on heavier material.

The "Bulldozer" die makes round or square bends on flatstock up to 3/16-in. thick and 4½-in. wide. "Edgebend" dies, two to a set, bend flatstock edgeways. Capacity is ¼ in. by 1¾ in. cold. Special OD steel tubing dies, 11 sizes from ⅜ in. to 2 in., bend from 1¼ to 24 in. radii.

Special pipe dies make close return bends on pipe with radii from 1¼ to 36 in. Eight sizes are available. Conduit dies of 90 deg, for bending standard pipe and rigid conduit, come in seven sizes from 1½ down to ⅜ in. Thinwall electrical metallic conduit dies bend from ½ to 2-in. conduit. *Hossfeld Mfg. Co.*

**Circle No. 22.**

* * *

## Carbon dioxide

"WELDING GRADE $CO_2$" is a specially prepared carbon-dioxide gas for use in inert-arc welding. This new type of gas is said to be necessary for best results in such welding. Use of carbon dioxide, rather than argon and helium, is claimed to result in substantial savings. *The Liquid Carbonic Corp.*

**Circle No. 23.**

Weldit
THE WORLD'S FINEST
REGULATOR
USED the WORLD OVER!
SERIES 50—Oxygen
The DUO-TROL gives the highest degree of accuracy for both light and heavy duty Welding, Cutting and Heating Jobs. Write for complete information.
SERIES 50—Fuel Gas
Canadian Dist.: Alloy Metal Sales, 181 Fleet St., E., Toronto 5, Ont.
Weldit INC. SINCE 1918
990 OAKMAN BLVD.
DETROIT 38, MICHIGAN

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

AN AIR REDUCTION PRODUCT

FOR WELDING AND CUTTING...

IN THE RED DRUM

HIGHEST QUALITY

DUST-FREE

NATIONAL CARBIDE

*Write for the name and address of the NATIONAL CARBIDE supplier nearest you.*

***National Carbide Company***

GENERAL OFFICES: 60 EAST 42ND STREET, NEW YORK 17, N. Y.

A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

*from page 6*

site, at 1926 Maple Ave., El Segundo, Calif., was expected by the first of this month.

The building will provide warehousing facilities for welding materials, industrial chemicals, ceramic materials, and plating and coating materials. The new location will also be headquarters for welding sales personnel for the West Coast.

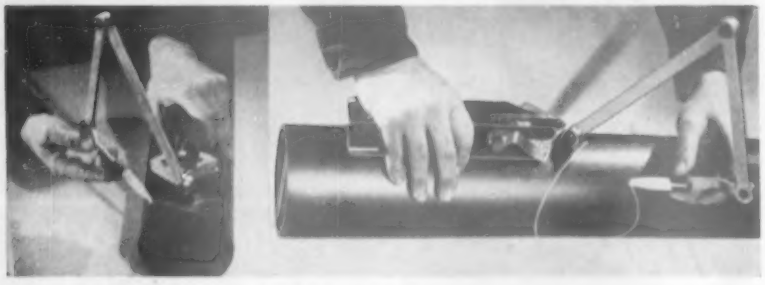
* * *

### Reid-Avery expands equipment facilities

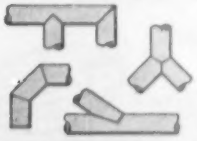
To meet increased demand for all types of automatic wire, Reid-Avery Co., Inc., Baltimore, is in the process of installing three new coiling machines of its own design—a continuous electrolytic copper-plating machine, and a continuous annealing line. The firm is also modernizing parts of the wire-drawing facilities, which now include continuous six-pass machines.

This equipment is expected to increase production of all types of alloy and specialty wires, in addition to low alloy and mild steel grades of rewound coils for automatic welding.


# LAY OUT ANY PIPE JOINT



LAY OUT ANY PIPE JOINT, SHOWN BELOW, on any size pipe from 1½" to 48"



**Mark Structurals**
Adapter for marking structural angles included with either model of the Contour Marker.

## The proven, fast easy way

IN LESS THAN 5 MINUTES you can lay out a Y, a T, an L or any angle joint with a Contour Marker. IT'S EASY and absolutely accurate; it is calibrated in both degrees and pitch. Just set the angle and with a smooth swing of the Contour Marker's soapstone point you are ready to cut! You save "man hours" as well as oxygen and acetylene gas because "cut and try" methods are eliminated.

Two Sizes: Standard, for pipes 1½" to 18" dia.; Jumbo, for pipes 16" to 48". Instruction book included. Belt case available. Write for information.

*Sold by welding supply dealers everywhere.*

CONTOUR MARKER CORP. OF CALIFORNIA
1843 East Compton Boulevard, Compton, California

BOYCE CENTERING HEAD marks center line at any degree of angle on pipe, shaft, tube. Leveling gauge on dial.

24" RADIUS MARKER is folding compass of Dural aluminum. Folds to 9¼" pocket size; weighs 8 oz.

PIPE FLANGE ALIGNER expands and centers inside pipe to align flange for welding. For any pipe dia. 3" to 12"

THE *Original* CONTOUR MARKER
ACCURACY PROVED BY TEN YEARS OF SERVICE TO WELDERS


### High-frequency tube welder installed in Ohio mill

Over 200 representatives of metal fabricating companies recently witnessed the premier showing of the New Rochelle Tool Corp.'s (New Rochelle, N. Y.) high-frequency resistance-tube-welding technique. Installed at the Abbey Etna Co.'s tube mill, Toledo, Ohio, the process is used in production of continuous seams.

The process uses effects of high-frequency reactance to direct and pinpoint current into edges of metal being joined. It is said to give greater energy concentration than other heating means.

* * *

### Steel founders association moves headquarters

The Steel Founders' Society of America was scheduled to move into its new offices, 606 Terminal Tower Bldg., Cleveland, on August 4. The Society formerly occupied offices in the Midland Bldg.

* * *

### Automation conference in Los Angeles in Sept.

The 10th annual Instrument-Automation Conference and exhibit of the Instrument Society of America is scheduled for Sept. 12-16, at Shrine Exposition Hall & Auditorium, Los Angeles.

* * *

### Welding supply firm has gala weekend opening

Arizona Welding Equipment Co., Phoenix, recently celebrated opening of a branch in Flagstaff, Ariz., with prizes and demonstrations. The firm, a distributor of acetylene and electric welding equipment, now has branch stores in Tucson, Phoenix and Flagstaff. Another branch is planned for Yuma.

The Flagstaff store will handle sawmill and industrial supplies, electrical tools and woodworking equipment. Clyde W. Durham is the branch manager.

* * *

### NACE to hold South Central meeting in Houston

The 1955 South Central Region meeting of the National Association of Corrosion Engineers will be held at the Hilton-Shamrock Hotel, Houston, Oct. 18-21.

### Coating process uses powdered ceramics

A process for coating a wide variety of substances—by feeding powdered ceramic materials through a simple flame gun—has been developed at Armour Research Foundation, Illinois Institute of Technology, Chicago.

Coatings resulting from the process—called "Flame Spray Ceramics"—are said to give greater heat resistance and chemical stability.

Application is similar to that of metallizing. Coating material is sintered layers of refractory and chemically inert matter, such as aluminum or zirconium oxides. Coating does not require heating the base unduly, as do ordinary ceramic coatings.

The coating is said to be effective for metal protection against high-temperature erosion.

* * *

### Pennsylvania Salt Mfg. Co. incorporates new subsidiary

In order to provide a supply of acid grade fluorspar for its Calvert City, Ky., fluorine chemical plant, the Pennsylvania Salt Mfg. Co. has incorporated a new subsidiary known as the Calvert City Chemical Co. The plant is expected to begin production at the end of the year.

* * *

### Oakite establishes export division

Formation of an export division to handle Latin American and overseas trade has been announced by Oakite Products, Inc., New York City. The firm, manufacturer of industrial cleaning and related materials, has appointed Mr. Harry V. Kerker manager of the new division. Offices are in New York City.

* * *

### Production Engineering Show in Chicago during Sept.

The Production Engineering Show will be held at Navy Pier, Chicago, Sept. 6-16. It will be held concurrently with the Machine Tool Show.

* * *

### GE Welding establishes new sales office & warehouse

A direct-sales office and warehouse in Buffalo, N. Y., was recently established by General Electric Welding Dept., York, Pa. W. G. Leaman, Buffalo metallurgist and welding engineer, has been named manager of the new office located at 701 Seneca St. It is the regional outlet for the department's equipment, electrodes and accessories.

* * *

### Worthington Midwest division moves Chicago office

The Midwest Regional Engineering & Service Div., Worthington Corp., Harrison, N. J., has moved into new quarters at 6124 N. Pulaski Rd., Chicago. The division was formerly located at 400 W. Madison St. L. R. Dise, manager, will direct operations.

The Chicago district sales office will remain at 400 W. Madison St.

### Girdler Co. awarded new contracts

The Girdler Co., Louisville, Ky., a division of National Cylinder Gas Co., Chicago, has been awarded a contract by B. F. Goodrich Chemical Co., covering engineering and construction work in the expansion of Goodrich's "Hycar" synthetic facilities in Louisville.

Girdler Co. has also received a contract from National Aniline Div., Allied Chemical & Dye Corp., to design and erect a combination hydrogen and carbon monoxide manufacturing plant at its Moundsville, W. Va., works.


**Now available for immediate delivery...**

**UNIFLEX Arc Welding Cable**

**the BEST designed cable made**

- Gives maximum service life under severe conditions of flexing, twisting, abrasion, impact, and heat.
- Has high resistance to aging, moisture, oils, most acids, and alkalies.

CHECK THIS CABLE CONSTRUCTION

**Flexible Conductor**

Uniflex conductor is made of thousands of electrolytically pure copper strands, each accurately drawn and annealed to make the wire soft and flexible. These strands are grouped into 7 divisions, 6 of which are positioned concentrically around the center group. This design distributes the strain of flexing equally among all strands, so maximum service life is assured for conductor under severest conditions of flexing and twisting.

**Anti-Corrosion Separator**

Uniflex copper conductor keeps clean and bright because the cable separator is moisture-proof, corrosion-proof, and slip-proof. It consists of an exclusive, laminated anti-corrosion barrier made of tough kraft paper, "armorized" with aluminum foil. The aluminum foil faces against the conductor and prevents moisture and chemicals (such as sulfur) from reaching the copper. The foil also hugs the conductor tightly to prevent jacket from slipping on conductor.

**Protective Jacket**

Uniflex jacket insures maximum resistance to the destructive effects of heat and time. Made from a scientifically formulated rubber compound, it remains lively and flexible, even after being age-tested in an oxygen bomb under heat for 14 days — an exposure equivalent to approximately 10½ years of service. The jacket compound also possesses adequate electrical insulating properties.

Write, wire or phone today for full details.

GW-U-1

**Power Supply Cable also Available**

General Construction: Copper, flexible stranding; separator; rubber insulation; conductors cabled with fillers; separator; rubber sheath. Conductors color coded black and white for 2-conductor cable; black, white, and green for 3-conductor cable; black, white, red, and green for 4-conductor cable.

UNIFLEX CABLE DIVISION
UNITED METAL CRAFT COMPANY
800 Lowell St.
Ypsilanti, Michigan

Phones: Ypsilanti: 6078
Detroit: LOgan 5-3934

Send complete details on
☐ Arc Welding Cable ☐ Power Supply Cable

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____

# If it's a "HI-AMP" You KNOW You've Bought The BEST

Write today for the complete story of the all NEW HI-AMP Electrode Holder and Ground Clamp.

Reports received from throughout the Country—wherever Welding is a factor—indicates that Welders, when asked about performance and durability of Electrode Holders and Ground Clamps, invariably reply in substance—"if it's a 'HI-AMP', you KNOW you've bought the BEST."

Claims of superiority, for *any* product, is the natural prerogative of *any* manufacturer—but the proof of performance must come from the user. Perhaps that's why "HI-AMP" sales are going up—up—up! Need we say more?

*Sold only through Welding Supply Distributors throughout the U. S. and Canada.*

Weld with Wagner

**WAGNER MANUFACTURING CO.**

250 W. 1st SOUTH ST. JACKSON, MISSOURI

**FOR QUALITY WELDMENTS**

**use**

Drawalloy CORPORATION

**QUALITY CONTROLLED STAINLESS STEEL**

**WELDING WIRE**

- **available in Spools, Coils and Lengths**
- **for Automatic and Semi-Automatic gas and inert arc welding**

Welding wire by Drawalloy is made to an exacting high standard . . . a high standard established by long-experienced welding men who know welding wire and how it must work. Set-ups for automatic and semi-automatic welding take more time than regular welding. That's why you want to be sure of satisfaction *before* you start. This *reliable* wire is weld-tested to give the best results every time. Write today for complete information and prices.

Drawalloy CORPORATION

LINCOLN HIGHWAY AT ALLOY STREET • YORK 12, PENNSYLVANIA


### Colorado Fuel assigns nickel-plating contract

Colorado Fuel & Iron Corp., New York City, has signed an exclusive contract with Bart Mfg. Corp., Belleville, N. J., for nickel-plating of CF&I steel plate products. Bart Mfg. will electro-clad steel plate, steel mill plate shapes, and flanged and dished heads.

CF&I will sell the new line through its sales offices. It believes this is the first time such products have become available on a large scale.

* * *

### Industry-owned nuclear test reactor to be built

The first industry-owned nuclear materials test reactor will be built by Westinghouse Electric Corp., Pittsburgh, Pa.

The reactor, to cost $650,000,000, will test materials under conditions of intensive nuclear radiation. The plant is planned on a 550-acre site near Blairsville, Pa., 40 miles east of Pittsburgh. The reactor will operate in the range of 10,000 kw.

* * *

### Welded window units

*—Nelson Stud Welding Div.*

**STUD welding permitted fast installation of pre-assembled aluminum window wall panels on the Equitable Life Assurance Bldg., San Francisco skyscraper. The units, about half are shown installed, were fastened to angle clips held in place by threaded studs, end-welded to steel inserts cast in concrete poured around the structural spandrels. About 7,500 studs were used. (See "Unique design used in welded skyscraper," WELDING ENGINEER, April, 1955.)**

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A new quarterly brochure on precision cleaning and finishing is being published by American Wheelabrator & Equipment Corp., 1331 S. Byrkit St., Mishawaka, Ind. The first issue contains a discussion of the wet blasting process and its applications.

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**"ART" FRIESE PRESENTS**

- ALUMINUM CONDUCTOR
- SUPER-FLEXIBLE
- RUBBER COVERED
- LIGHT WEIGHT
- SIZES—#6 TO #4/0
- AMPS—75 TO 550

*Active Dealers Desired Write Today!*

**Remember—in 1934 we introduced**

***"MAJOR" WELDING CABLE***

**and shipped millions of feet all over the world.**

**WELDING ENGINEERING CO.**

333 N. Michigan Ave. • Chicago 1, Ill.

**FOR BEST RESULTS USE**

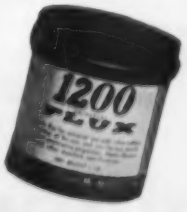
**Silvaloy**

**Silver Brazing Alloy preforms for Production Brazing. Rings, Stamped or Coined Washers and Wire Forms**

All inquiries given immediate attention and shipments made on short notice. Technical service men are available to assist you in proper joint design. Silvaloy brazing alloys also available in wire, strip, and powder from stocks in six branch warehouses.

**1200 FLUX**

**Use when silver brazing Brass, Bronze, Copper, Nickel-Silver, Steel, Stainless Steel, Monel, Nickel, Inconel and other Nickel alloys. Furnished in ½ lb., 1 lb., 5 lb., 30 lb., and 65 lb. containers.**




**STEEL SALES**

3348 S. PULASKI ROAD • CHICAGO 23, ILLINOIS

PLANTS: DETROIT, ST. LOUIS, MILWAUKEE, MINNEAPOLIS, INDIANAPOLIS

OFFICES: KANSAS CITY, GRAND RAPIDS

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Drawalloy CORPORATION

**QUALITY CONTROLLED STAINLESS STEEL WELDING WIRE**

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PLANTS: DETROIT, ST. LOUIS, MILWAUKEE, MINNEAPOLIS, INDIANAPOLIS

OFFICES: KANSAS CITY, GRAND RAPIDS

### Vacuum process brazes titanium at low temperatures

A titanium-brazing process, requiring lower-than-normal temperatures, has been developed by the Stainless Processing Div., Wall Colmonoy Corp., Detroit. The process can be used with silver or silver-manganese brazing alloy to fabricate an all-titanium alloy assembly or to join titanium to other alloys.

The method needs no fluxes and permits simultaneous use of multiple brazing operations. In nature, the process is a form of vacuum brazing. Use of temperatures below those of normal brazing is claimed to eliminate distortion. Wetting and flow characteristics are of such quality as to insure complete brazing of joints. This allows brazing of complicated shapes.

* * *

### Inco opens technical section in Atlanta, Ga.

The International Nickel Co., Inc., New York City, has opened a Southeast States Technical Field Section for its Development & Research Div., with headquarters at 3179 Maple Drive, N. E., Atlanta, Ga.

The section, covering North and South Carolina, Georgia, Florida, and Alabama, will furnish industry in the area with technical assistance and data on nickel alloys. Richard J. Greene is in charge of the section.

* * *

### Dust collector developed at IIT

A high-efficiency dust collector has been developed jointly by National Dust Collector Corp. and Armour Research Foundation, Illinois Institute of Technology, both of Chicago.

Termed "Air Scrubber", the collector uses contact between air and water. Airborne dust is transferred to a liquid stream, settled out of the water, and then disposed.

* * *

### Chicago's lakefront site of General Motors show

General Motors' "Powerama" will be held in Chicago, Aug. 31 through Sept. 25, on a 1,000,000-sq-ft area on South Lake Shore Drive, adjacent to Soldier Field. The exposition will depict the contributions of Diesel and aircraft power. Admission will be free.

* * *

### Distributor appointments

*Edward Valves, Inc.*, East Chicago, Ind.: W. E. Bowler Co., representative in the Philadelphia and Reading, Pa., areas has been assigned additional territory including Washington, D. C., and Baltimore.

*John Tillman & Co.*, Long Beach, Calif.: The National Welders Supply Co., Charlotte, N. C.; Miami Welding Supply Co., Miami; Keenan Welding Supply Co., Albany, Ga.; Essex Welding Equipment Co., Newark, N. J.

*K-G Equipment Co., Inc.*, Allentown, Pa.: D & R Welding Supply Co., Streator, Ill.; Burton C. French Co., Mansfield, Ohio; Gano Welding Supply Co., Charleston, Ill.; Keelor Steel, Inc., Minneapolis; Mercury Welders Service, Norfolk, Va.

*Progressive Welder Sales Co.*, Detroit: Welders Supply, Inc., Dallas, Texas.

*United Welders, Inc.*, Detroit: Moehlenpah Engineering, Inc., St. Louis; Charles Perkins, Berkley, Mich.; Clyde Smith, Warren, Ohio; State Machinery Co., Indianapolis.

*WW Alloys, Inc.*, div. Fansteel Metallurgical Corp., North Chicago, Ill.: Bond Welding Service Co., Drexel Hill, Pa.


in Shipbuilding as in other great industries
MILLER WELDERS are preferred

**St. Louis Shipbuilding and Steel Co.,** largest builders of inland towboats in the world, require welds that will withstand a maximum amount of abuse.

Look anywhere in St. Louis Shipbuilding's mammoth yard and you will see Miller Selenium Rectifier type D.C. arc welders—in single units or in batteries of four and five for greater output.

For dependable welds, St. Louis Shipbuilding prefers the Miller S.R. welder. Miller is glad to be aboard.

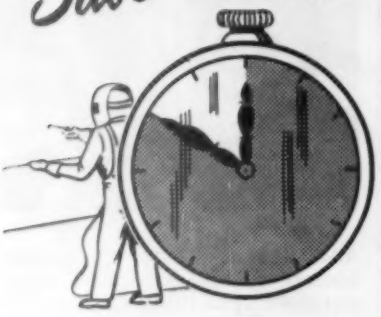
ARC / SPOT miller GENERATORS WELDERS

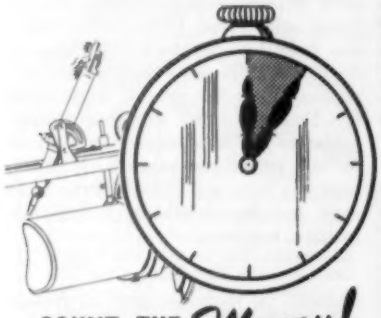
Miller Selenium Rectifier type D.C. Arc Welders are available in four wide range models. For complete information on these and other Miller arc and spot welders, contact us today at no obligation, of course.

miller
ELECTRIC MANUFACTURING COMPANY, INC.
APPLETON, WISCONSIN

Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal, P.Q.

Save THE TIME...





COUNT THE *Money!*

90% TIME SAVING ON ALL PIPE SHAPE-CUTTING

Reports from welders all over the country back up the claim that with the H & M Shape-Cutter and Beveler you can save at least 90% of the time spent hand-cutting Ells, Tees, Y's, Saddles, and other irregular shapes. Mr. Welder, THAT'S A SAVING WORTH LOOKING INTO!! Every minute you can save means more profit dollars in your pocket. It also means that you're in a lot better position when the seals are broken on those pipe fabrication competitive bids. Here's how the unique H & M works: (a) First you mount the desired pattern on your H & M Cutter; (b) Next, slip the split, horse-shoe-shaped gear over the pipe; (c) Snap the machine in place with the spring-tension chain fasteners; (d) Light and adjust the torch; (e) Give the hand-crank a few turns — that's all there is to it. For the full story on the H & M

WRITE FOR THE FREE FOLDER "MORE PROFIT DOLLARS IN PIPE FABRICATION"

H&M PIPE BEVELING MACHINE CO.

Trade Mark Reg. U.S. Pat. Off.

311 E. 3rd St. • Ph. Diamond 3-0241 • Tulsa, Ok.

*Henry L. Pohndorf* recently was named vice-president in charge of sales by National Welding Equipment Co., San Francisco. Mr. Pohndorf, in the welding industry for many years, has been chief engineer and recently general sales manager. *William G. Norman* has been named chief engineer.

* * *

*Albert J. Smith* has been appointed sales manager, Electrode Div., The McKay Co., Pittsburgh. He was a metallurgical engineer in the Technical Service Division of the firm. Prior to his appointment, he was assistant sales manager of the Electrode Div. Mr. Smith is a member of the American Welding Society and the American Society for Metals.

* * *

*Gene Wedereit* was recently named director of advertising for National Cylinder Gas Co., Chicago. He will supervise all advertising for the company, its divisions and affiliates. Mr. Wedereit has been director of advertising of the Girdler Co. and Tube Turns, Louisville, Ky., since 1943.

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*R. H. ("Hase") Munn, Jr.*, was recently named district manager of the Pittsburgh area for WW Alloys, Inc., a division of Fansteel Metallurgical Corp., North Chicago, Ill. Mr. Munn will cover western Pennsylvania, West Virginia and southeastern Ohio. He will supervise sales of the firm's aluminum-bronze castings and forgings, resistance-welding electrodes and allied products. He will headquarter in the Empire Building, Pittsburgh.

* * *

*James F. Magin*, vice-president and a director of the Square D Co., Detroit, has been appointed general manager of the Industrial Controller Div., Milwaukee. Mr. Magin joined the firm in 1946, and was elected a vice-president in 1953.


THE MOST ADVANCED AUTOMATIC FLUXING SYSTEM EVER OFFERED FOR BRAZING

EASY WAY TO LOW COST

• All-State "Jet Flux" Auto-Dispenser No. 1 as you get it from the factory . . . is a pressure cylinder complete with automatic dispenser, controls, and hose with connections . . . ready to tie in, without special tools, to single or multiple brazing stations.

• Only one supply item — All-State "Jet Flux"—fluxes brazing work automatically through the fuel gas.

*Ask to see "Jet Flux" Demonstrated by your Distributor*

A-S DISTRIBUTORS EVERYWHERE

All-State

ALL-STATE

WELDING ALLOYS CO., INC.
White Plains, N. Y.

# BECKER

## CARBON WELDER BRUSHES

***for all types and makes of welding equipment***

Everything you need from *one* source, with *one* responsibility. The fast, economical way to order. Catalog gives complete specifications, factory numbers, scaled drawings, etc. Write for your free copy today.

**WHOLESALERS:**
Some Distributorships still open.
Write for information.

**BECKER BROTHERS CARBON CO.**
3450 SO. LARAMIE AVE. • CICERO 50, ILLINOIS



*The* **Champ of Clamps!**

THE **GRAND** QUIKCET DUAL GRIP TYPE "AS"

Quick setting double-action clamp grips work more securely. Holds irregular and off-parallel surfaces as well as flat work due to pincer action. Easily tightened in cramped areas.

4 SIZES: 2½" TO 6" OPENING
SPATTER-PROOFED—NACO NO. 6 STEEL
(80,000 LBS. TENSILE)

**Famous GRAND "C" Clamps**

Alloy Steel (Stronger than forged) Spatter-Proofed Screws, Deep Throat—Replaceable Swivels

| LIGHT SERVICE SERIES | MEDIUM SERVICE SERIES | HEAVY SERVICE SERIES |
|---|---|---|
| L SERIES | ASM SERIES | ASH SERIES |
| 8 SIZES 2" TO 12" | 7 SIZES 4" TO 18" | 8 SIZES ¼" TO 12½" |

NCG

STOCKED and DISTRIBUTED BY NATIONAL CYLINDER GAS COMPANY



***Make More Money on EVERY Welding Job . .***

**METAL BOND**
SOLDERING AND WELDING
**PRODUCTS**

We have been making Metal Bond Products for more than 25 years and successful Welders all over the country have been using them to advantage.

METAL BOND
METAL BOND MFG. CO.

***AIDS TO GOOD WELDING JOBS***

- Tinning Compounds • Soldering Salts • Hard Metal • Aluminum Solder • Mouldough • Brazing Flux No. 10 • Special No. 31 • Seal-X-O • Cast Iron Welding Flux No. 4 • All Steel Wire Brushes and Holders.
- Make your own test—also send for our pocket-size catalog which contains information and descriptions of our money-saving METAL BOND Products.

**METAL BOND MFG. CO.**
MONTGOMERY CITY, MO.
P.O. BOX 215

**Fitzgerald**

**Ruckman**

Alloy Rods Co., York, Pa., recently announced changes in field representatives. *John Fitzgerald*, formerly field representative for the Pacific Coast sales office, El Segundo, Calif., has been transferred to the Newark, N. J., sales office. *Richard James, III*, replaces Mr. Fitzgerald. Mr. James has been the firm's distributor-representative in the Eastern States area for the past three years. *J. R. Ruckman* has been appointed district manager for the Southern and Southwestern territory.

• • •

Changes in the sales staff of Nelson Stud Welding Div., Gregory Industries, Inc., Lorain, Ohio, are as follows: *George E. Kennedy*, field engineer in the Los Angeles territory, to architectural representative on the West Coast. He will work in the Los Angeles-San Francisco Bay area. *Walter E. McArthur*, field engineer in Cincinnati, has been transferred to Los Angeles. *Herman S. Slinkard*, in charge of Nelson sales for Lincoln Electric Co., Sidney, Australia, replaces Mr. McArthur in Cincinnati. *Vincent G. Probst*, field engineer in the Denver area for two years, has been transferred to Dallas, Texas. *Ray M. Lucas*, in charge of industrial engineering for the production dept. at Lorain, Ohio, will replace Mr. Probst in Denver. *Linus C. Hansen* has been named field engineer in the Chicago area. He has been an industrial sales engineer for the Latrobe Steel Corp. for the past eight years.

• • •

*Robert B. Yettick* was recently named district sales manager in Seattle, Wash., for Birdsell Mfg. Co., Palo Alto, Calif. Since 1945, Mr. Yettick has been managing owner of the East Pacific Co., manufacturers' representatives in the Pacific Northwest, and has represented Birdsell Mfg. Co. for the past year.

Consult
EISLER

FOR
GENERAL
WELDING
EQUIPMENT

Eisler
Spot Welder
No. 250-VDAS

Eisler
Indexing Turntable
No. 88-GT-8

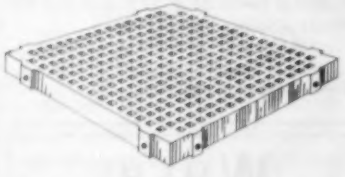
Eisler designs and manufactures spot welders from 1 KVA as well as a complete range of butt, saw and band welders and other welding equipment, including indexing turntables — standard, or to your order, electric or gas soldering and brazing machines.

Write today without obligation!

EISLER ENGINEERING CO., INC.
Charles Eisler Jr., President
749 SO. 13TH ST., NEWARK 3, N. J.

WELDING and
SET-UP PLATENS
(Shipyard bending block type)

Floor plates—bending tables—layout tables—straightening tables—dog blocks—bending blocks—blacksmith blocks. 5'x5'—6'x6'—6'x8'—6'x10' — 5'x10' — 6'x12' — 3'x3' — either 6" or 7" thick.



Weldments dogged down to these planed semi-steel blocks stay flat during fabrication.

Write for low cost details.

STAHL EQUIPMENT CO.
94 Washington St.
Brookline Village 46, Mass.

*John K. Light* was recently appointed assistant sales manager of the Arcos Corp., Philadelphia. The firm manufactures welding rods and electrodes. Mr. Light was formerly New England district sales manager. He will work out of the Philadelphia office. *James A. Brickett, Jr.*, formerly a salesman in the New England area, succeeds Mr. Light as district sales manager. He will headquarter in Boston. He is a member of the American Welding Society.

* * *

Several changes in its technical service staff were recently announced by Oakite Products, Inc., New York City. *William H. Duckworth* is now serving the metal industries in south Milwaukee. He replaces *R. J. Baltzell* who has been transferred to the Elmira, N. Y., territory. *George F. Becker* is the new representative in the metal industry in Kansas City, Mo., replacing *Otto W. Jommersbach*, transferred to the Brooklyn-Queens area in New York City. *Raymond Abazia* has been named representative among the metal industries in Newark, N. J. *H. Wilder* has been transferred to the Akron, Ohio, territory. He has been replaced in La-Crosse, Wis., by *R. P. Lind*. *W. D. Hudson* has been transferred to Peoria, Ill. He has been replaced in Topeka, Kan., by *D. R. Cowell*.

* * *

*Dave ("Bud") Rankin, Jr.*, son of *D. B. Rankin*, president, has become associated with the Rankin Mfg. Co., Alhambra, Calif. He takes over duties in the national "Ranite" sales office.

* * *

## Died . . .

*Rufus E. Zimmerman*, retired vice-president and chairman of the research policy committee, U. S. Steel Co., New York City, died recently after a brief illness. Dr. Zimmerman became associated with steel research in 1914 when he joined American Sheet & Tin Plate Co., later a part of U. S. Steel. He pioneered in techniques of ship welding, methods of refining ores, and helped to develop electrolytic tinplate.

* * *

*John H. Chittick*, sales engineer for Atlantic Acetylene Corp., Trenton, N. J., was killed recently in an automobile accident, according to word received by WELDING ENGINEER.

TOTAL VISIBILITY
in TIG Welding

See what you are welding and work in comfort with . . .

- The lightest and smallest 300 amp TIG welding torch.
- Only TIG torch made with a transparent cup.
- A TIG torch that makes spare parts such as "O' rings and washers unnecessary.

Available in either Pyrex, ceramic, or quartz in all standard size cups. Special sizes and lengths made to your specifications!

Tec Welding & Fabricating Co.
300 Paterson Ave.
Carlstadt, New Jersey

BUY
SELL
USE
SHAWINIGAN
CARBIDE

SHAWINIGAN
PRODUCTS
CORPORATION
EMPIRE STATE BUILDING
NEW YORK 1, N. Y.

"Red Head"
WELDING CLAMPS
• Designed for Welding •
No Threads To Damage

1. Case hardened threads are always protected from weld spatter and never exposed to damage in open or closed position.

2. The clamp body is cut from solid plate, thereby insuring extreme rigidity and giving great resistance to bending or twisting.

3. Heat treated chrome molybdenum alloy handle offers great resistance to bending.

23 stock sizes

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1968 CLYBOURN AVENUE
CHICAGO 14, ILLINOIS

Meet your friends in CHICAGO
at the NEW HOTEL
HAMILTON
in the heart of the loop
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Check these Features
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V FREE CRIBS FOR THE BABIES—COTS FOR THE CHILDREN

ALL THIS FROM $4 SINGLE AND UP

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Samuel Leeds, Pres.,
BOX 100

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20 S. DEARBORN ST.
at MADISON
CHICAGO

# ADVERTISERS IN THIS ISSUE

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## WHERE TO BUY

6714 Bryn Mawr Ave.

# CLASSIFIED THE WELDING SHOPPER ADVERTISING

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AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. W.E.

### EQUIPMENT WANTED

NATIONAL SALES ORGANIZATION wants additional line of products and equipment to sell welding dealers and users. Reply Box 855, WELDING ENGINEER, 12 E. Grand, Chicago 11, Ill.

### SCHOOL

WELDING—A profitable trade. Demand for trained men. Learn quickly at best equipped school in U.S. Non-profit. G. I. approved. Catalog free. Write Hobart Welding School, Box U-851, Troy, Ohio.

### POSITION WANTED

ATTENTION SALES MANAGERS: Salesman and sales engineer open for sales position—Practical man with two years' technical training—23 years' experience in welding industry—Fully versed in oxyacetylene and electric welding—Also experienced in industrial sales, distributor setups and direct selling. Located in Chicago. Box 852, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill.

### HELP WANTED

MANUFACTURER'S REPRESENTATIVE to sell plate, bars, weldments, specialty items to Welding Supply and Contractor Equipment Dealers, Heavy Equipment Operators, Quarries, Mines, Industrial Maintenance Users. Excellent Commissions. Write in detail territory now covering. Reply Box 856, WELDING ENGINEER, 12 E. Grand, Chicago 11, Ill.

## HARD SURFACING ELECTRODE SALES ENGINEER

Well-known electrode manufacturer wants hard-surfacing sales engineer. Must be free to travel extensively. Some knowledge of welding metallurgy and actual welding experience. Good advancement possibilities. Salary open. Submit full resume. Replies will be held in strict confidence. Our own employees know of this ad.

**Box 854, WELDING ENGINEER**
**12 E. Grand, Chicago 11, Ill.**

## WELDING ENGINEER

Expanding programs in welding, brazing and soldering have created an opening for a welding research engineer. This is an opportunity for diversified experience in joining. Salary commensurate with experience and training. Liberal employee benefits include generous tuition refunds for graduate study. Write:

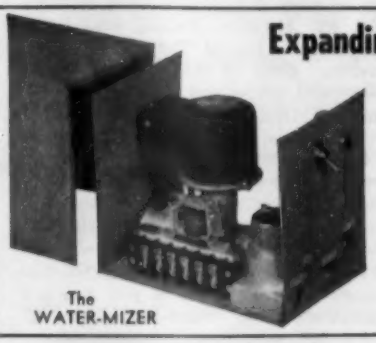
**Mr. T. E. DePinto**
**ARMOUR RESEARCH FOUNDATION**
**of Illinois Institute of Technology**

**10 West 35th St.**
**Chicago 16, Illinois**

### BUSINESS OPPORTUNITIES

*REPLIES (Box No.): Address to office at 12 E. Grand Ave., Chicago 11, Ill.*

## Expanding Sales—Outlets Needed



The WATER-MIZER

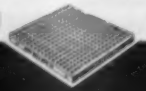
The Water-Mizer is used on welders to save water. (Can pay for itself in water savings within 7 months.) Here is a needed product with an excellent performance record in many shops. Expanding sales require country-wide representation and a number of territories are open for distributor or sales representatives. A profitable item with a big potential. Write Van Vooren Products Company, 2133 9th St., East Moline, Illinois.

**VAN VOOREN PRODUCTS CO.**
**2133 9th St., East Moline, Ill. 3-6598**

**A NICE REPEAT BUSINESS**
**JOBBERS WANTED IN EVERY CITY TO SELL "WELDER'S PAL" EYE DROPS**
On the market for 20 years
**CARHOFF COMPANY**
**11706 Kinsman Rd., Cleveland 20, Ohio**

### EQUIPMENT FOR SALE

**Welding Platens**



**Acorn Iron & Supply Co.**
901 N. Delaware Ave. Phila. 23, Penna.

**3,000 Lb. "UNION MELT" Flux, Grade 20, 20 x 200 Size.....7½c per Lb.**
**INTERNATIONAL MILL SUPPLY COMPANY**
**1287 West Adams Street**
**Jacksonville, Florida**

**50% DISCOUNT ON WELDING OR SHOP CAPS**
Made of brightly colored duck, sanforized and washable. Retail price $1.00 each. Order a trial dozen. Satisfaction guaranteed.
**LOUISIANA WELDING SUPPLY CO.**
**1931 Plank Road, Baton Rouge, Louisiana**

1—Size 10, 5¾ x 5 Used Model D-VB Sullivan Air Compressor, Class WL-60, Pressure 125 lbs. Maximum speed 870 RPM, good condition
1—500 lb. Steam or Compressed Air Trip-hammer in good condition. Used.
**MIKE'S WELDING SUPPLY CO.**
**P. O. Box 1373 Great Falls, Montana**

CUTTING MACHINES, AIRCO Como & Radiographs, Nat 5's Harris K's.
SEAM WELDER, Progressive, 150 KVA, New.
SPOT WELDER, National, 40 KVA, Used
CUTTING TORCHES, Used, Oxwald, Airco, Harris.
WELDING TORCHES, New, Rego GV.
BRONZE—STAINLESS—AMPCOTRODES.
NO. 12 LENSES, ELECTRODE HOLDERS.
**RALL SUPPLY CO. 51 E. 42nd St., N.Y.C. 17**

### EQUIPMENT FOR SALE

## BARGAIN SALE

**SURPLUS ALUMINUM WIRE 36"**
VARIOUS TYPES AND SIZES
WRITE FOR FREE PRICE LIST
**Box No. 853, Welding Engineer**
**12 E. Grand Ave., Chicago 11, Illinois**

**IN 100-LB. LOTS, F.O.B. SCRANTON**
**SALE OF SURPLUS ELECTRODES**
AMPCO-TRODE, 3/16" x 14" No. 18 Aluminum Bronze Coated DC Electrodes in Good Condition—25 lb. Cartons—80c lb.
**SCRANTON WELDING SUPPLY COMPANY**
**1301 Wyoming Ave. Scranton, Penna.**

## RECONDITIONED WELDER BARGAINS

G-E, Lincoln, Hobart, P&H welders completely rebuilt with new welder guarantee—immediate delivery. M-g sets—150 to 400 amps. Ac transformer—200 to 500 amps. Engine-drive dc—200 and 300 amps. 300 amp. dc generators—"build-your-own".

**Typical Bargain**

G-E, 6WD33C, 300 amp., 40v, 440/220v, 60cy 3 ph stationary set $285—portable sets available.

***Write, wire or Phone***
**R. L. KOHLBRY**
**Machinery & Welder Corporation**
**1324 W. Fulton St., Chicago 7, Ill.**
**HAYMARKET 1-3620**

**WELDING BOOK BARGAINS**
**½ PRICE SALE**
**WELDING DESIGN HANDBOOK**, formerly $2.00 now $1. Paper cover, 8½ x 11 in., 84 pages.
**WELDING—ITS QUESTIONS AND ANSWERS**, was $1.50 now 75c. Cloth cover, 5 x 8½ in., 176 pages.
No charges or C.O.D.—cash with order postpaid.
**WELDING ENGINEER**
12 E. Grand Ave., Chicago 11, Ill.

# free literature . . . . . USE CARD ON OPPOSITE PAGE

**51.** BACKING RINGS—General Ceramics Corp. Complete data is available on "Pyrotone" ceramic backing rings, adaptable for field and shop pipe welding. Rings are said to be easily removed upon completion of weld.

**52.** NOTCHER—J. F. Kidder Mfg. Co., Inc. Catalog sheet describes the "Little Blacksmith," No. 43X notcher, of all-steel construction with a 90-deg notch.

**53.** ELECTRODES — Morgan Aluminum Welding Rod Co. Folder lists and describes available "Marco" aluminum and magnesium electrodes, rods, and spooled wire.

**54.** PLUGS, CONNECTORS—Mechanical Products Corp. 8-page catalog No. 354 describes and illustrates "Quick-Seal" test plugs and filling connectors for pressure-vessel testing.

**55.** SPOT WELDERS—Aro Spotwelders Corp. Illustrated catalog gives details of portable spot welders currently available.

**56.** ELECTRODE MERCHANDISER—Tweco Products Co. Sheet describes the "Counter Helper" merchandiser for electrode holders, clamps and cable accessories.

**57.** ALUMINUM FINISHING—Frederick Gumm Chemical Co., Inc. 15-page "Aluminum Finishing Manual" discusses chemical-treatment methods of cleaning, etching, deoxidizing and descaling.

**58.** SPOT WELDING—The Taylor-Winfield Corp. No. 554 of "Weld-It" describes roll spot welding by a resistance seam welder.

**59.** GRINDING TOOL—R. C. Haskins Co. Illustrated sheet gives details on the "HaskAir" turbine grinder and accessories, including carbide sets and mounted points.

**60.** HARDENING COMPOUND—Armor-Tuf Sales Corp. Folder describes steel-hardening process using liquid "Armor-Tuf." Compound is painted on.

**61.** RESISTANCE WELDING — Acme Electric Welder Co. 16-page catalog No. 504 lists available resistance-welding alloys, tips, electrodes and tip holders.

**62.** SILVER BRAZING ALLOYS—Handy & Harman. Bulletin No. 20 discusses types of "Easy-Flo" and "Sil-Fos" low-temperature silver-brazing alloys and their uses.

**63.** INDUCTION HEATING — Westinghouse Electric Corp. 12-page booklet, B-6519, treats induction-heating equipment for metalworking industry, and typical applications.

**64.** ABRASIVE CLEANING — American Wheelabrator & Equipment Corp. First issue of new quarterly brochure, on precision cleaning and finishing, treats wet-abrasive blast-cleaning.

**65.** AUTOMATIC WELDER — Pandjiris Weldment Co. Bulletin SAM-1 describes semiautomatic manipulator with horizontal arc travel of 8 ft and built-in jacks.

**66.** ABRASIVES, GRINDERS—Metal Removal Co. 38-page illustrated catalog lists abrasives and grinding tools in stock with a section on grinding hints.

**67.** NICKEL RESISTANCE—The International Nickel Co., Inc. Bulletin T-29 is a discussion of resistance of nickel and high-nickel alloys to hydrochloric-acid solutions.

**68.** RW ALLOYS—Welding Sales & Engineering Co. Line of "Tuffaloy" resistance-welding alloys is described in 20-page illustrated catalog and price list.

**69.** WELDER—Sciaky Bros., Inc. Illustrated 8-page bulletin 334-3 describes the "PMCO 2 ST," air-operated, press-type, resistance spot welder.

**70.** HARDFACING—Haynes Stellite Co. Vol. 6, No. 7 of "Alloys Digest" describes latest applications of hardfacing alloys.

**71.** OXYACETYLENE TORCHES—Marquette Mfg. Co. Brochures give data and specifications on "Super-Jet," "Star-Jet," "Aero-Jet" and "Master" cutting outfits.

**72.** ELECTRODE—Alloy Rods Co. "Use Iron Powder Low Hydrogen Electrodes for All-Position Welding" is an illustrated folder stating advantages of these electrodes in welding.

**73.** TITANIUM ALLOY—Mallory-Sharon Titanium Corp. Bulletin about "MST 6A1-4V", a titanium alloy, lists properties, recommended heat treatment, and welding and forging procedures.

**74.** ARC WELDER—Royal Arc Industries, Inc. Folder gives details of models "200AS," "200-A" and "400-A," portable arc welders.

**75.** ACCESSORIES—J. M. Ragle Industries. 4-page folder describes chipping hammer, gauntlets, positioner, drills, clamps, and other welding supplies.

**76.** PROPANE TORCH—Velocity Power Tool Co. Bulletin No. 1413-6 explains properties of "Torch-O-Matic" (type P) propane gun-type torch for soldering, brazing, burning, etc.

**77.** WELDOR'S GUIDE—Hobart Bros. Co. "How to get better welds" is a 39-page, vest-pocket-size guide for welding.

**78.** CONTOUR MARKER—Contour Marker Corp. "The Contour Marker" is a 23-page illustrated booklet describing operation and use of this measuring tool.

**79.** METAL CLEANER—The Diversey Corp. Bulletin No. 49A discusses and illustrates the features of "Diversey No. 909" granular, heavy-duty soak-tank cleaner.

**80.** STAINLESS STEEL—Crucible Steel Co. of America. "The Joining of Crucible Rezistal Stainless Steels" is a 23-page pamphlet describing various methods of joining stainless steel by the fusion process.

**81.** ELECTRODE HOLDERS — Bernard Welding Equipment Co. Catalog sheet explains characteristics and uses of "Short-stub" electrode holders.

**82.** CABLE—Uniflex Cable Div. 20-page booklet contains information on resistance-welding cable and secondary connectors.

**83.** POSITIONER—Cayuga Machine & Fabricating Co., Inc. Bulletin No. 5306 is an illustrated discussion of the "Cayuga-Matic" welding positioner.

**84.** WELDING CONTROL — Robotron Corp. Bulletin 361 gives information about types of available resistance-welding controls.

**85.** CONNECTION KIT—Cam-Lok Div. 4-page folder describes portable kit for making rubber-insulated cable connections in the plant or field.

**86.** STUD WELDING — KSM Products, Inc. Booklet discusses stud welding and lists current varieties of studs and their applications.

**87.** TORCH TIPS—National Torch Tip Co. 7-page "Torch Tips" catalogs a selection of replacement cutting tips and welding tips.

**88.** CUTTING TORCH — Universal Cutting & Welding Equipment Co. 4-page illustrated folder contains specifications and parts list of the "Rigger" cutting torch.

**89.** WELDING WIRE—Page Steel & Wire Div. Folder gives details of types of automatic steel welding wire available, including the grade and size.

**90.** GRINDING WHEELS—Bay State Abrasive Products Co. Leaflet catalogs line of disc-wheels and cut-off wheels for grinding and cutting. An application chart is included.

**91.** WELDING MACHINE—Linde Air Products Co. Leaflet describes and illustrates the "DS-45" automatic-welding machine for both production and repair welding.

**92.** AMMONIA DETECTOR—Allied Chemical & Dye Corp. Pocket-size booklet of paper strips, impregnated with phenolphthalein, is for detection of ammonia leaks. A strip saturated with water and held near a suspected leak shows ammonia presence by turning red.

**93.** ALLOY STEELS—Steel & Alloy Tank Co. 32-page brochure, "Prototypes in Boiler-plate," describes fabrications of special vessels for chemical, and nuclear-energy industries, including reactions of stainless and alloy steels under stress.

**94.** FLOW METER—Elematic Equipment Corp. Illustrated sheet discusses "Elematic" indicating and recording flow meters for use in inert-gas arc welding.

**95.** WELDING CONTROL—Worthington-Mullenbach Controls Div. Bulletin R-1700-B17 describes "Arctrol," a portable, remote control for arc-welding machines. Also included are illustrations of parts, and a parts and price list.

**96.** SAFETY GOGGLES—United States Safety Service Co. "Saf-I-Flex" are all-purpose plastic goggles described on catalog sheet. They can be worn over personal glasses. They are light-weight, made of soft, pliable vinyl with grid vents to prevent fogging and clouding.

# WELDING INFO-AIDS

**USE THIS CARD** for Literature, Catalogs, and Bulletins shown on facing page, and for those featured in this month's ads as listed on next page

*Also information about*

**NEW PRODUCTS** described on pages 64 to 73

Every month WELDING ENGINEER lists many new catalogs and bulletins available from manufacturers. All are yours for the asking. However, this service is valuable to you only if you use it.

**USE POSTPAID CARD➔**

★ For copies of any manufacturers' bulletins described on page at left, circle the number of the items on card at right. Fill in your name, title, company and address. This has to be done only once on each post card. You need no postage.

★ For additional information on New Products described in this issue, circle the numbers of the items that interest you. The New Products section begins on page 64.

**WARNING!**

Illegible or incomplete addresses may keep you from receiving the information you desire. And remember, cards postmarked after the deadline date cannot be processed.

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Company_____

Address_____

City_____ State_____ 8/55

**NOT GOOD AFTER NOVEMBER 1, 1955**

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| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 |
| 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 |
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**BUSINESS REPLY CARD**

First Class Permit No. 45854, Chicago, Ill.

**Welding Info-Aids**

**Welding Engineer**

**12 East Grand Avenue**

**Chicago 11, Ill.**

# literature offered in advertisements in this issue:

**101. Air Reduction** Sales Co.—Catalog 3818 on complete line of welding and cutting torches, tips and accessories.
**102. Alloy Rods** Co.—Complete information on new Bronze-Arc C electrodes.
**103. Alloy Rods** Co.—Data on new lime electrodes for high temperature and pressure applications.
**104. American Platinum** Works, Inc.—48-page booklet, "A Complete Guide to Successful Silver Brazing."
**105. Arcair** Co.—Booklet on money-saving uses of arc and compressed air method of weld preparation.
**106. Arcair** Co.—Samples of plain or copper-coated carbon electrodes available.
**107. Becker** Bros. Carbon Co.—Catalog and complete specifications, drawings, etc. of brushes for all types of welding equipment.
**108. Burdett** Oxygen Co.—"Burdox" catalog describes products for all welding processes.
**109. Carborundum Co.**—Data on abrasives and grinding wheels.
**110. Carol Cable** Co.—Complete information on "Dynapower" arc welding cable.
**111. Contour Marker** Corp.—Information on contour-marking devices.
**112. Drawalloy** Corp.—Information and prices on stainless steel welding wire.
**113. Duro** Engineering Co.—Folder on lightweight electrode holders.
**114. Eisler** Engineering Co., Inc.—Data on spot welders and general welding equipment.
**115. Fibre-Metal** Products Co.—Bulletin No. 43 describes attachment for providing both eye and head protection with safety cap.
**116. General Electric** Co.—Bulletin GEA-6243 describes new a-c welders.
**117. Goldsmith** Bros. Smelting & Refining Co.—Data book on low temperature silver brazing.
**118. H & M Pipe** Beveling Machine Co.—Folder, "More Profit Dollars in Pipe Fabrication".
**119. Harnischfeger** Corp.—Information on P & H a-c/d-c welders.
**120. Hobart** Bros. Co.—Complete electrode catalog.
**121. Hobart** Bros. Co.—Information on various types of a-c and d-c welders.
**122. Hossfeld** Mfg. Co.—Bulletin on benders and special dies for bar, angle iron and pipe bends.
**123. International Nickel** Co.—Booklet on test-welds of 21 different alloy combinations.
**124. International Nickel** Co.—Revised edition of *Welding Bulletin T-2.*
**125. Linde** Air Products Co.—Booklet F-8778 details information on Mig spot-welding process.
**126. P. R. Mallory** & Co., Inc.—Welding catalog helps choose proper alloys, electrodes, holders, forgings, castings, etc.
**127. Metal Bond** Mfg. Co.—Pocket-size catalog of soldering and welding products.
**128. Metal & Thermit** Corp.—Information on all types of arc and thermit welding products.
**129. Miller** Electric Mfg. Co.—Complete data on selenium-rectifier and other arc and spot welders.
**130. Norton** Co.—Details on new resinoid bonded grinding wheels.
**131. Page** Steel & Wire Div.—Folder DH-402 lists 26 analyses of automatic welding wire.
**132. Sellstrom** Mfg. Co.—Information on all types of welding safeguards for eye and face.
**133. A. O. Smith** Corp.—Catalog on mild-steel electrodes.
**134. Stahl** Equipment Co.—Details on welding and set-up platens.
**135. Steel Sales** Co.—Information on silver brazing fluxes.
**136. Stoody** Co.—Application and procedure information covered in hardfacing guidebook.
**137. Tec Welding** & Fabricating Co.—Data on Tig welding torch cups.
**138. Titan** Metal Mfg. Co.—Folder describes welding rod compositions and uses.
**139. Tweco** Products Co.—Data and prices on complete line of electrode holders, ground clamps and cable connections.
**140. Uniflex Cable** Div.—Complete details on arc welding cable.
**141. Uniflex** Cable Div.—Data on power supply cables.
**143. United Wire** & Supply Corp.—"Phoson" folder for low temperature copper brazing.
**144. Vickers** Electric Div.—New bulletin on magnetic amplifier-rectifier d-c welder.
**145. Victor** Equipment Co.—Catalog on cutting torches, blasting nozzles and tips.
**146. Wagner** Mfg. Co.—Complete story on "Hi-Amp" electrode holder and ground clamp.
**147. Weldit,** Inc.—Complete information on "Duo-trol" regulator for light and heavy-duty welding.
**148. Westinghouse** Electric Corp.—Information and samples available on "XL-610" electrodes.

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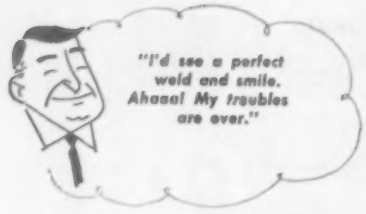

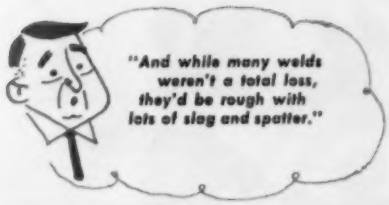


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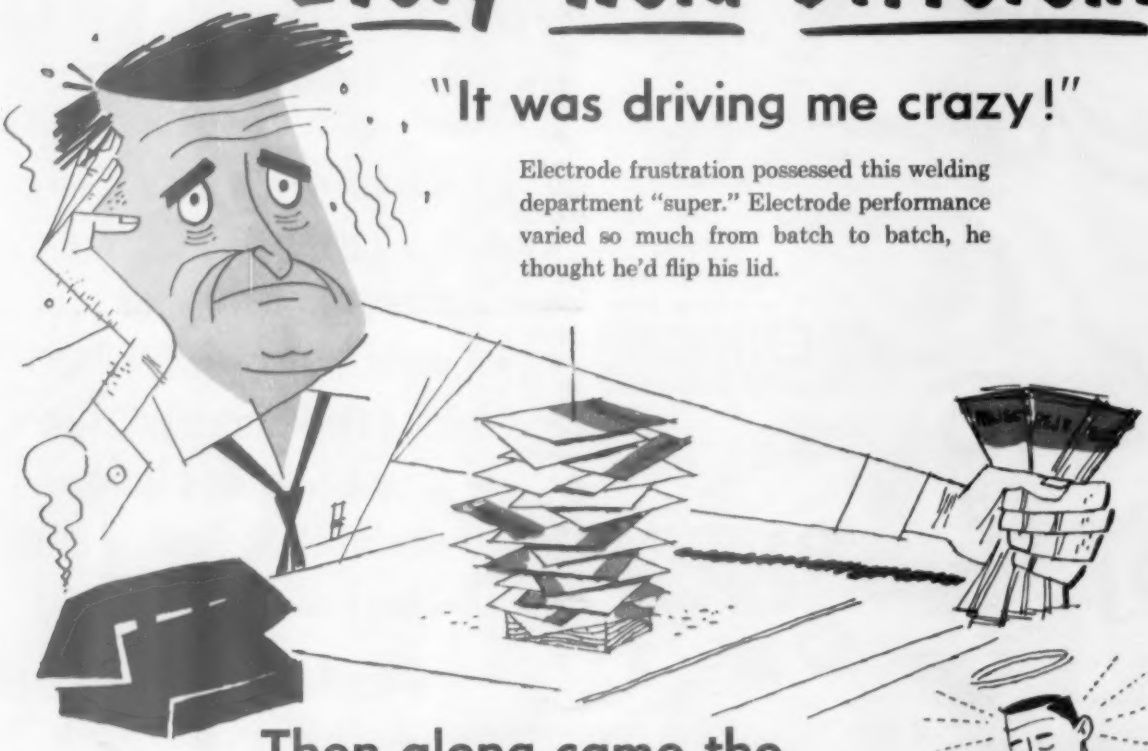

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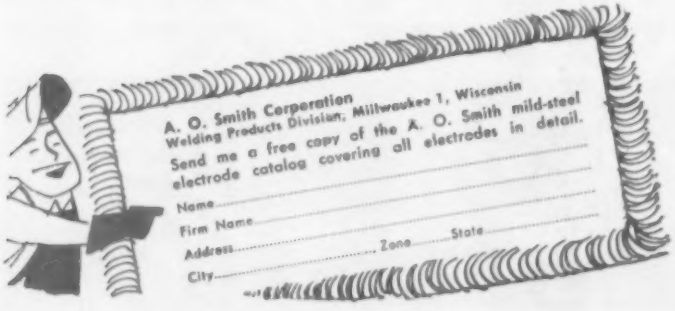


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